



Environmental Assessment for Power Purchase Agreement Photovoltaic Solar Array Installation

102nd Intelligence Wing

Otis Air National Guard Base

Massachusetts Military Reservation

May 2013

EXECUTIVE SUMMARY

The 102nd Intelligence Wing Environmental Management Office has prepared this Environmental Assessment to comply with the National Environmental Policy Act of 1969, as amended. This document evaluates the potential environmental impacts of the proposed Air National Guard 20-year lease of land on the Massachusetts Military Reservation (MMR) Landfill to a private entity for construction and operation of a solar photovoltaic system (SPVS). The proposed actions would support the Energy Policy Act of 2005 and and Department of Defense energy policy goals.

The SPVS would provide Otis ANGB with a cost-efficient renewable energy source to augment the existing commercial power supply, which relies heavily on fossil fuels. The SPVS would consist of solar panel arrays sufficient to generate up to 6 megawatts for consumption solely by Otis ANGB. The arrays will consist of surface-mounted solar photovoltaic panels and associated support infrastructure on approximately 37 acres of the landfill cap. In non-cap areas, conduit could be run underground to connect the array to the transformers and the transformers to the main power grid, which runs past the site. There would be light construction activities associated with the proposed project, such as minor trenching, building a surface access road, and the non-invasive assembly of the arrays.

Based upon the nature of the activities that would occur under the proposed and alternative actions, Otis ANGB environmental program managers determined that the following resources would not be adversely affected: land use, air installation compatibility, air quality, noise, water resources, cultural resources, geology and soils including Environmental Restoration Program (ERP) sites, socioeconomics, safety, occupational health, and hazardous materials and hazardous and solid waste. The existing conditions were evaluated and documented as the basis for determining the environmental consequences.

There is a minor impact to biological resources. During the filing of the project notification to the Massachusetts Environment Policy Act (MEPA), seven breeding pairs of three bird species which were found on the site were identified as threatened or endangered by the Commonwealth of Massachusetts; the Upland Sandpiper (Endangered), the Vesper Sparrow (Threatened), and the Grasshopper Sparrow (Threatened). In consultation with the Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program (NHESP), the 102nd IW and MMR have agreed to a mitigation plan to replace the grassland habitat disturbed by this project by declaring another tract of Otis ANGB land surplus which will then become part of an existing wildlife management area which abuts the base's southern boundary.

ACRONYM LIST

AFCEC	Air Force Civil Engineer Center
ANGB	Air National Guard Base
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EA	Environmental Assessment
EO	Executive Order
EPA	Environmental Protection Agency
IRP	Installation Restoration Program
IW	Intelligence Wing
MEPA	Massachusetts Environmental Policy Act
MMR	Massachusetts Military Reservation
MPP	Mashpee Pitted Plain
MW	Megawatt
NEPA	National Environmental Policy Act
NHESP	Natural Heritage and Endangered Species Program
NREL	National Renewable Energy Lab
NWOU	Northwest Operable Unit
O&M	Operations and Maintenance
PCM	Post Closure Monitoring
PPA	Power Purchase Agreement
PV	Photovoltaic
ROD	Record of Decision
SPVS	Solar Photovoltaic System
USAF	United States Air Force

TABLE OF CONTENTS

ACRONYM LIST	3
TABLE OF CONTENTS.....	4
1.0 PURPOSE, NEED, AND LOCATION FOR PROPOSED ACTION.....	1
1.1 Purpose and Need for Proposed Action.....	1
1.2 Location of Proposed Action	2
2.0 DESCRIPTIONS OF PROPOSED ACTION AND ALTERNATIVE ACTIONS	5
2.1 Proposed Action.....	5
2.2 Alternative Action 1 – Other Otis ANGB Locations for Solar 1	6
2.3 Alternative Action 2 – Other Otis ANGB Locations for Solar 2	6
2.4 Alternative Action 3 – Other Generation Technologies	6
2.5 No-Action Alternative	7
2.6 Federal, State, and Local Permits, Licenses, and Fees Required	7
3.0 AFFECTED ENVIRONMENT	8
3.1 The MMR Installation Restoration Program	8
3.2 Land Use – Description of the Landfill and IRP	8
3.3 Air Installation	11
3.4 Air Quality	11
3.5 Noise	11
3.6 Base Utilities.....	12
3.7 Water Resources	12
3.8 Biological Resources.....	13
3.9 Cultural Resources	14
3.10 Geology and Soils	14
3.11 Socioeconomics.....	14
4.0 ENVIRONMENTAL CONSEQUENCES.....	15
4.1 Land Use.....	15

4.2	Air Installation Compatible Use Zone.....	15
4.3	Air Quality	15
4.4	Noise	16
4.5	Base Utilities.....	16
4.6	Water Resources	16
4.7	Biological Resources.....	17
4.8	Cultural Resources	18
4.9	Geology and Soils	18
4.10	Socioeconomics.....	18
4.11	Safety and Occupational Health.....	19
4.12	Hazardous Materials/Waste and Solid Waste.....	19
5.0	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES	20
6.0	CUMULATIVE IMPACTS	20
7.0	CONSULTATION AND COORDINATION	21
	LIST OF PREPARERS.....	22
	WORKS CITED	22
	APPENDICES.....	22

1.0 PURPOSE, NEED, AND LOCATION FOR PROPOSED ACTION

1.1 Purpose and Need for Proposed Action

Executive Order (EO) 13423 (Strengthening Federal Environmental, Energy, and Transportation Management) and EO 13514 (Federal Leadership in Environmental, Energy, and Economic Performance) established goals and requirements for federal agencies to reduce emissions of greenhouse gasses and other air pollutants, and improve energy efficiency by implementing renewable energy projects on government properties and by obtaining electricity from renewable energy sources when practicable. In response to EO 13514, the Department of Defense has set a goal of reducing greenhouse gas emissions by 34 percent compared to a 2008 baseline. The Proposed Action will help to meet the goals of EOs 13423 and 13514.

The 102nd IW on Otis ANGB is the host unit with respect to utilities on the MMR. Most other units on the MMR (Army National Guard, US Coast Guard, Dept of Agriculture, among others) receive their power through the Otis ANGB base grid and are metered and charged by the 102nd IW. Otis ANGB buys all of its power from Hess on a regional contract negotiated by the Defense Logistics Agency. It is distributed to the base by NStar, the local distribution company serving Cape Cod and southeastern Massachusetts. Otis ANGB receives two bills; one from Hess for power usage, the other from NStar for transmission and distribution.

The governing headquarters for Otis ANGB is the National Guard Bureau which provides liaison and shared situational awareness capability and serves as a channel of communications among the National Guard Joint Force Headquarters – State (NGJFHQ - State), the Joint Staff, US Air Force Combatant Commands, the Military Departments, and the Office of the Secretary of Defense. Additionally, it facilitates coordination between DoD Components, NG JFHQs-State, and the NG of the several States to enhance unity of effort. In this capacity, the National Guard Bureau is key to the approval chain for this project which ultimately ends with the Office of the Secretary of Defense.

The vast majority of the electricity in New England is produced by steam turbine generators, which are fueled by non-renewable resources such as coal and natural gas. Lease of Otis ANGB land for the construction and operation of a SPVS, which would provide the base with up to 25% of its required electricity, will substantially decrease the MMR's reliance on non-renewable energy sources. The proposed actions would support the Energy Policy Act of 2005, increase overall DoD use of renewable energy, and allow Otis ANGB to meet, nearly two decades in advance, the DoD installation energy policy long-range goal for renewable energy use.

1.2 Location of Proposed Action

The proposed location was identified as a result of a feasibility study funded by the Environmental Protection Agency (EPA) and published by the National Renewable Energy Laboratory (NREL) in July 2011.

MMR has three landfill caps that are suitable for ground-mounted PV systems. For this report, the caps are numbered 1, 2, and 3, from west to east. These caps have short vegetation without any trees, so there are no significant shading issues. The caps are relatively flat on top with slopes ranging from 2.0 to 3.5, degrees and are uniform in all directions. Only the relatively flat areas and southern facing slopes were considered for PV systems. The remaining areas of the landfill caps were not considered for a PV system because of slope and orientation.

The landfill is managed by the Air Force Civil Engineering Center (AFCEC) as part of the MMR Installation Restoration Program (IRP). Details of the landfill site and its associated management plan are outlined in Section 3: Affected Environment.

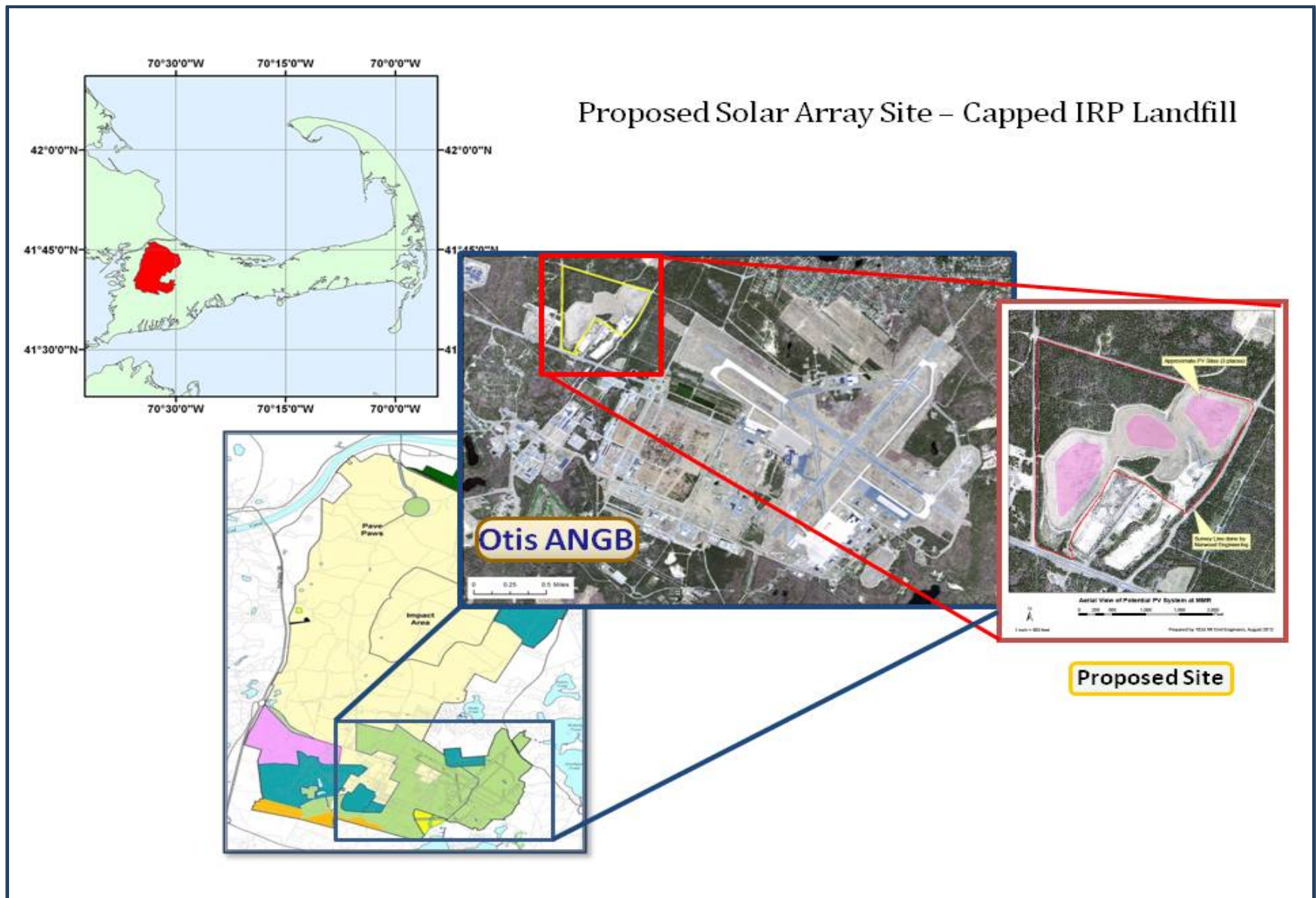


Figure 1: Location of MMR and Proposed Solar Array Installation



Figure 2: Close up of proposed SPVS locations on landfill caps and type of species in each area. A total of seven nesting pairs were found in 2012.

2.0 DESCRIPTIONS OF PROPOSED ACTION AND ALTERNATIVE ACTIONS

2.1 Proposed Action

Otis ANGB proposes to lease 60 acres of the capped landfill adjacent to Connery Ave., and managed by the Air Force Civil Engineering Center's (AFCEC) Installation Restoration Program, to a third party for a period of 20 years for construction of a (SPVS). Through a power purchase agreement between Otis ANGB and the SPVS developer, the SPVS would provide Otis ANGB with a cost-efficient renewable energy source to augment the existing energy provided by Hess via NStar. The array will reduce Otis ANGB's dependence on the commercial power supply and contribute toward the MMR's energy security.

The SPVS would consist of solar panel arrays sufficient to generate up to 6MW DC that would be transformed to 4.6 MW AC. The system will likely consist of fixed arrays mounted at a 30 degree angle facing to the south. The final layout and selection of specific panels and mounting parameters will be at the discretion of the chosen contractor to maximize output on the site. The arrays would be held on ballasted, surface-mounted frames so as not to penetrate the surface of the landfill cap.

The SPVS would tie into the Otis ANGB electrical system at one site on a nearby overhead circuit, East Feeder A, which runs along the southern end of the site. The SPVS would be designed to shut down immediately if the Otis ANGB power system fails. The interconnection will be installed with appropriate electrical protection to prevent damage to either the base grid or the solar array in the event of an electrical mishap.

All power produced from the SPVS would be used by Otis ANGB once a lease is executed, a Power Purchase Agreement (PPA) approved, and the SPVS constructed. It is estimated that the SPVS would meet 25% of Otis ANGB's annual electrical power demands. Electric meters would be placed at the interconnect point to quantify the exact output to Otis' feeder. There would be potential for some power to intermittently travel backward through the Otis transformer and into the NStar system on days when the SPVS produces more power than the base demands.

Cables connecting the inverters to the grid interconnection would be placed underground in trenches (as these will not be on the capped area) that could be as deep as three feet and covered with earth. Following emplacement of the conduit, disturbed areas would be graded to maintain current drainage patterns.

A temporary staging area, where solar panels would be assembled, and other construction equipment and material would be stored, would be designated in the project area. The entire landfill site is enclosed by a chain link fence with a gate, and would not require any secondary security. Regular cleaning of the solar panels would be accomplished by either rinsing with water, blowing with compressed air, or a combination of both. All solid waste generated during construction, operation, maintenance, and decommissioning would be removed by the contractor and disposed of at an appropriate disposal facility outside of Otis ANGB. At the end of the 20 year lease, the contractor will remove the entire array and associated equipment and restore the site to its original condition.

2.2 Alternative Action 1 – Other Otis ANGB Locations for Solar 1

This alternative considered the collective use of several detached parcels of land within the secure area of Otis ANGB . However, this alternative is not preferred for several reasons. In order to maximize the amount of solar power generated to make the project commercially worthwhile to a contractor, several detached parcels of land, each more than 500 yards from each other, would be needed. While a total of approximately 4 MW could be installed across these collective parcels, this alternative requires more transformers, interconnects, cabling, and security fencing than the proposed alternative, eroding the economic benefit and commercial incentive. Further, since these collective sites are all within the secure area (Otis ANGB is a secure area within the already-secure MMR), additional administration would be needed to ensure proper access. This alternative would result in reduced economic and commercial benefit to the contractor while increasing administrative costs and security oversight to Otis ANGB . This alternative would continue to leave the capped landfill as an untapped underutilized resource.

2.3 Alternative Action 2 – Other Otis ANGB Locations for Solar 2

Other parcels which are on ANGB controlled land but not within the secondary cantonment area were also considered. However, just as presented in the Alternative 1 discussion above, similar inefficiencies and reduced economic benefits and commercial incentive would result. Additionally, due to their location the parcels have specific suitability and utility for future development and prospective missions at Otis ANGB . Since some of the parcels involve protected managed grasslands there would be a requirement to address environmental impacts through environmental mitigation activities. Finally, development of a SPVS on these parcels, based on their location, would negatively impact the overall esthetic appearance of the installation. An SPVS on any of these parcels are deemed incompatible with design standards at the Massachusetts Air National Guard's premier installation.

2.4 Alternative Action 3 – Other Generation Technologies

In 2010 AFCEC conducted a study of the MMR to evaluate suitable sites for wind turbines and other alternative energy technologies on the Reservation. This study identified five optimum locations for wind turbines and ruled out the feasibility of other renewable energy generation systems such as geothermal and hydrokinetic. At the time of Request for Proposal issuance for this SPVS project, all five of these wind turbine locations will have a wind turbine installed or construction under way. Other potential sites for wind turbines were identified in the study but are not preferred because they are limited in the amount of energy they could produce. Other alternative energy generation systems were deemed unsuitable for the MMR because the resource do not exist.

2.5 No-Action Alternative

The No Action Alternative does not meet the purpose of the project to generate renewable energy electricity in a cost effective method in order to reduce the electrical costs associated with the essential operations at Otis ANGB and the MMR. Nor does this alternative address the need to meet the goals and requirements of EOs 13423 and 13514. It does not contribute to the energy security and independence of the base and, finally, if the No-Action Alternative is chosen, Otis ANBG will incur an additional \$13 Million of energy costs over the next 20 years that could be avoided by commercial development of a SPVS.

2.6 Federal, State, and Local Permits, Licenses, and Fees Required

- Interconnection Agreement with NStar
- Conservation Management Permit issued by NHESP
- Permit to net meter from Massachusetts Department of Public Utilities (not required if not net-metered)

3.0 AFFECTED ENVIRONMENT

3.1 The MMR Installation Restoration Program

The IRP at the MMR is managed by the Air Force Civil Engineer Center (AFCEC). The IRP is being conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Contingency Plan. The MMR is listed on the National Priorities List as Otis Air National Guard/Camp Edwards in Falmouth, Massachusetts. The Comprehensive Environmental Response, Compensation, and Liability Information System number for the MMR site is MA2570024487.

The DoD (United States Air Force [USAF]) is the lead agency for CERCLA remedial actions at the MMR. EPA, USAF, and National Guard Bureau (NGB) are parties to the Federal Facility Agreement for the MMR. The Massachusetts Department of Environmental Protection (MassDEP) is not a signatory of the FFA, but is an active participant in the clean-up process and provides guidance and direction to the process through several chartered boards and committees.

3.2 Land Use – Description of the Landfill and IRP

The landfill is located in the southern portion of the MMR and is bounded by Turpentine Road to the east, Frank Perkins Road to the west, Herbert Road to the north, and Connery Avenue to the south. The landfill occupies approximately 100 acres of open to heavily wooded terrain and began operating in 1941 as the



Figure 3: The capped landfill - proposed location for 6 megawatt SPVS installation

primary solid waste disposal facility at MMR. From the late 1940s until 1984, unregulated disposal activities were conducted at the site; from 1984 to 1993, regulated disposal activities were conducted by the NGB at the landfill as a component of the MMR Hazardous Waste Management Plan. Disposal at the landfill occurred in six areas consisting of five distinct cells and a natural kettle hole. The cells are designated by the years representing the approximate end date of waste disposal activities. The six disposal areas include the 1947, 1951, and 1957 cells, referred to as the Northwest Operable Unit (NWOU), which occupy approximately 40 acres of the total landfill area; and the 1970 and Post-1970 cells and the Kettle Hole, which occupy approximately 50 acres. The remaining 10 acres comprise the space between and surrounding the cells. The thickness of waste burial has not been accurately determined, but is estimated to be about 20 feet thick for the 1970 and Post-1970 cells; while the thickness of waste in the Kettle Hole is unknown. Approximately 100 additional acres were used in and around the site for construction soil material borrow pits, access roads, staging areas, etc.

Accurate documentation of the wastes disposed of at the landfill does not exist. The wastes are believed to include general refuse, fuel tank sludge, herbicides, solvents, transformer oils, fire extinguisher fluids, blank small arms ammunition, paints, paint thinners, batteries, dichlorodiphenyltrichloroethane (DDT) powder, hospital wastes, municipal sewage sludge, coal ash, and possibly live ordnance.

Environmental investigations and risk assessments for the landfill indicated that through residential exposure to source area groundwater there was risk that exceeded the U.S. EPA and MassDEP criteria for cancer and non-cancer target risk levels. An interim remedy was selected that was designed to protect human health and the environment and comply with applicable or relevant and appropriate requirements. The interim remedial action for the landfill consisted of the following actions:

- Leaving NWOU wastes in place beneath the soil and vegetative cover and installing down gradient monitoring wells to assess any impacts to groundwater from the older cells and to determine if the interim remedial action is an appropriate long-term remedial action.
- Construction of a landfill cover system (consisting of an impermeable cap) on the 1970 and Post-1970 cells and the Kettle Hole.
- Preparation of a post-closure monitoring (PCM) plan for the 1970 cell, the Post-1970 cell, and the Kettle Hole.

Closure activities at the landfill, including capping the three most recently used cells (since they were the apparent sources of groundwater contamination) and instituting PCM, were completed in December 1995. In addition to the caps, the landfill cover system includes an associated drainage system, and 70 gas vents designed to release gas from the interior of the landfill. Gas probes are located around the perimeter of the caps to monitor subsurface vapor. A perimeter fence already existed around the entire landfill (capped cells and NWOU) at the time of capping. The primary purpose of the landfill cover and associated drainage structures is to minimize the amount of precipitation that infiltrates the landfill and produces leachate (water containing contaminants, nutrients, and microorganisms) that could reach the aquifer.

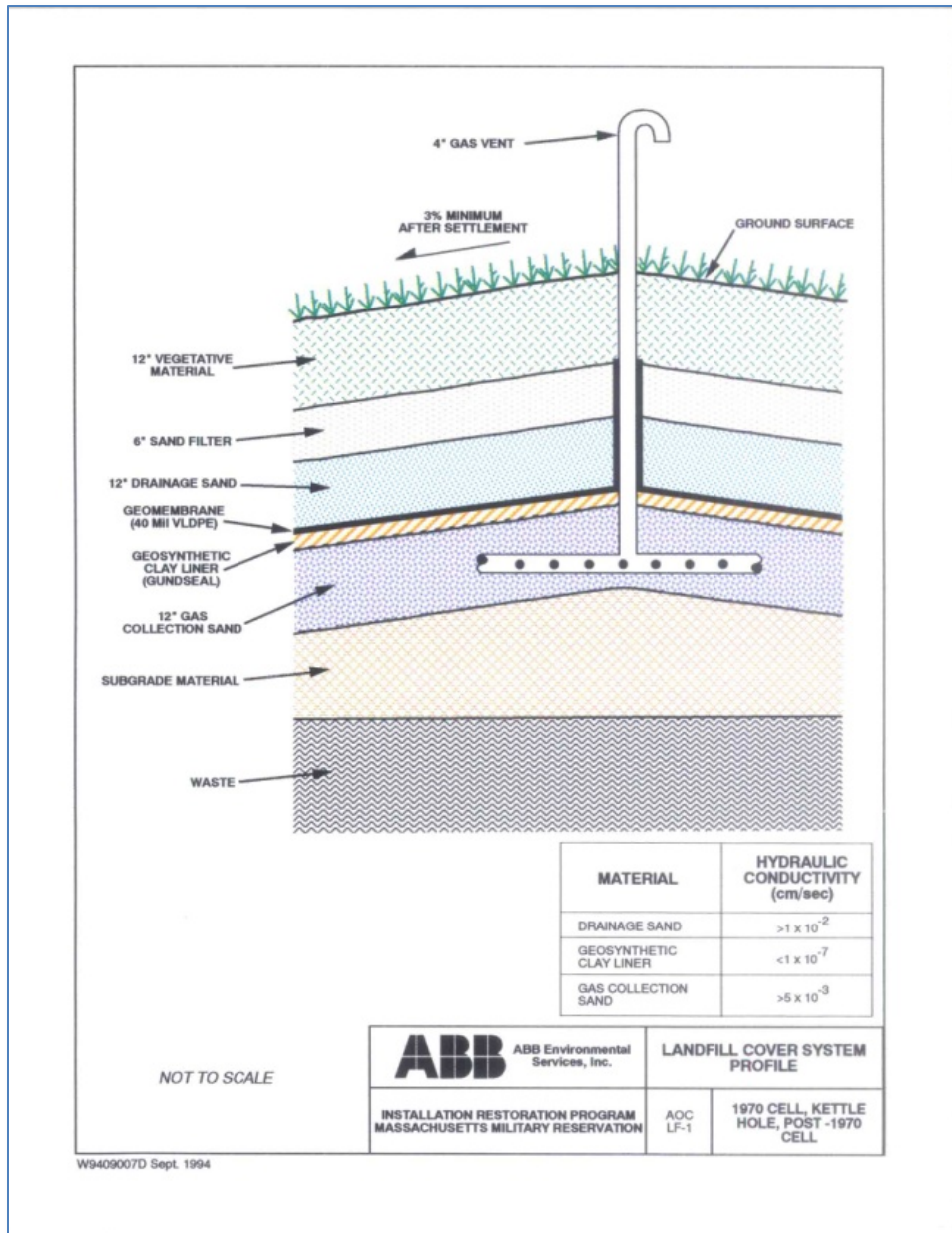


Figure 4: Schematic of the landfill cap, designed to prevent water leaching through the material in the landfill. Preventing perforations maintains its watertight integrity, hence requiring a ballasted, surface-mounted system.

The PCM Plan for the capped landfill outlined the following actions:

- Post-closure maintenance and monitoring of the cover system is to be conducted for a minimum of 30 years after the completion of cap construction. To verify that the cap maintains its structural integrity, it is inspected for animal burrows, erosion rills, settlement depressions, intrusive vegetation, seeps, and sedimentation in ditches and culverts. Post-closure maintenance is performed any time a loss of integrity is noticed; landfill inspections and land surveys are performed regularly.
- Landfill gas and groundwater quality at the landfill are to be monitored as appropriate. The landfill interim remedial action will allow time to further evaluate the environmental impact of the 1947, 1951, and 1957 cells (i.e., the NWOU cells) on groundwater quality.
- A regular performance monitoring evaluation of the interim remedial action.

In 1996, the EPA and MassDEP approved the closure report for the landfill capped cells, thus initiating the PCM plan. The Record of Decision (ROD) for the landfill was signed in October 2007 and included continued monitoring and maintenance of the landfill cap along with land use controls. The NWOU was not included in the ROD; a decision document for that area is scheduled to be completed in 2013.

3.3 Air Installation

The US Coast Guard now operates the airfield and control tower with limited fixed and rotary wing traffic, primarily USCG MH-60T Jayhawk search and rescue helicopters, and HC-144A Ocean Sentry surveillance aircraft and Army National Guard UH-60 Blackhawk helicopters. The airfield consists of 2 runways, several large aircraft parking aprons, and several hangars.

3.4 Air Quality

Barnstable County, Massachusetts is a nonattainment area for ozone (8-hour standard) but is in attainment for other criteria pollutants. The standard for particulate matter, 2.5 microns or less, will not be addressed for several years (Massachusetts Department of Public Health 2009). The air quality of the project site is unaffected by the landfill. Monitoring of the surface vents and perimeter monitoring points by AFCEC shows the landfill is producing no appreciable amounts of gas, including methane.

3.5 Noise

There are no known studies of ambient noise levels in the immediate vicinity of the project sites. Currently, noise at the project sites is typical of a rural setting. Sources of ambient noise include intermittent vehicular traffic on Connery Ave, the main gate road, vehicular traffic on abutting range access roads, periodic crowd noise from a bicycle motocross track adjacent to the site, weather disturbances, the aircraft from the USCG Cape Cod Air Station, the adjacent Army National Guard Tactical Training Base and natural sources (e.g., wildlife, wind). Because the surrounding areas of the project sites are relatively suburban, loud noises are relatively common, and ambient noise levels are likely between 45 and 55 A-weighted decibels (dBA) under calm wind conditions. Noise from the inverters is not expected to affect the tactical training base due to its distance from the source. The same situation applies to the bicycle motocross track.

There are no sensitive noise receptors such as schools, hospitals, or daycare centers in the immediate vicinity of the project sites. The nearest permanently inhabited noise-sensitive receptors are limited to off-base residences approximately 0.8 km (0.5 mile) to the northeast.

3.6 Base Utilities

Otis ANGB and the MMR are fed by one primary distribution line of 12,500 kilovolt-amps (kVA), one standby line of the same capacity, and several smaller, isolated distribution lines to remote parts of the MMR. All lines are supplied with power by NStar. The primary feeder comes from off the MMR, across the base, and enters the base grid at the Otis ANGB 7.5 megavolt-amps (MVA) primary substation where the main meter is housed. From this substation, the power is distributed across the base in 5 main feeders which are interconnectable and, to the maximum extent practical, are metered for the primary tenant organization served by that feeder. Nearly all relevant lines (primary feeder to Otis as well as the base distribution circuits) are above ground and are owned and maintained by the 102nd IW.

3.7 Water Resources

The MMR is located over the Sagamore Lens which was designated as a sole source aquifer that provides drinking water to the residents of Upper Cape Cod. The sole source aquifer designation is in place to ensure that projects built on Cape Cod are designed and constructed so that they do not create a significant hazard to public health (EPA 1982).

This sole-source aquifer is primarily unconfined and is recharged by infiltration of precipitation at a rate of approximately 30 inches per year. The groundwater flow in the landfill area is generally from east to west from the landfill towards Buzzards Bay (specifically Red Brook Harbor and Squeteague Harbor).

Groundwater flow paths dip gradually, as indicated by gradually deepening contaminant plumes, into the aquifer instead of following a strictly horizontal flow path. This is attributed to accretion of recharge from precipitation at the aquifer surface rather than density differences between uncontaminated water and water containing dissolved chemicals.

Prior to closing and capping, leachate from the landfill cells migrated into the groundwater forming the Landfill-1 (LF-1) plume. The landfill cells that contributed to the LF-1 plume included the 1970, post-1970, and kettle hole. The purpose of the landfill cap and associated drainage structures is to minimize the amount of precipitation that infiltrates the landfill and produces leachate (water containing contaminants, nutrients, and microorganisms) that could reach the aquifer and act as a continuing source for the LF-1 plume. The cap has been effective at reducing the leachate that contributed to the LF-1 plume.

Monitoring data indicate that a small portion of the LF-1 plume remains at concentrations above groundwater cleanup standards adjacent to the landfill source area, but the plume is disconnected from the source. Based on historical monitoring data and a direct push investigation completed adjacent to, and down gradient of, the landfill in 2007 and 2008, the landfill is no longer a significant continuing source for the LF-1 plume.

The selected remedy for the LF-1 groundwater plume includes active treatment, natural attenuation, land use controls, and a provision to replace the Bourne Public Water Supply Wells. The active treatment is an extraction, treatment, and infiltration/reinjection system that began operation on 26 August 1999. It included five extraction wells pumping at 700 gallons per minute, an infiltration gallery, two infiltration trenches, and a treatment plant housing two 20,000 pound granular activated carbon units to remove the contaminants from the groundwater. A reinjection well was later added to supplement the infiltration system and a sixth extraction well was added in 2006 to capture continuation along the southern edge of the groundwater plume.

Based on the most recent groundwater monitoring data collected in 2012, the LF-1 plume is approximately 3.5 miles long, and extends from the landfill source area (in the northeast) to the west-southwest where the uncaptured portions of the northern and southern lobes of the plume discharge with groundwater to Red Brook Harbor and Squeteague Harbor, respectively. The LF-1 plume is approximately 4,500 feet wide and approximately 110 feet thick. The footprint of the LF-1 plume occupies approximately 919 acres.

3.8 Biological Resources

The MMR conducts an annual survey of bird species in various locations across the Reservation, including the grasslands of the landfill site. In the July 2012 survey, seven breeding pairs of three bird species listed as protected by the State of Massachusetts (but not federally listed by the US Fish and Wildlife Service) were found nesting on the landfill site. This discovery necessitated a habitat mitigation plan, approved by the Massachusetts Division of Fisheries and Wildlife, to provide alternative habitat conducive to these species elsewhere on the Reservation if the proposed solar array project were to proceed.

The species of concern that were discovered nesting on the proposed site are:

- Upland Sandpiper (Endangered)
- Vesper Sparrow (Threatened)
- Grasshopper Sparrow (Threatened)

The complete list of bird species found during the July 2012 survey is provided in Table 1 below.

There are no other protected species or species of concern inhabiting the proposed site.

Table 1: Bird Species Inhabiting Proposed Project Location (Survey, July 2012)

Common Species Code	Species Name	Common Species Code	Species Name
UPSA	Upland Sandpiper (Endangered)	COLO	Common Loon
GRSP	Grasshopper Sparrow (Threatened)	MODO	Mourning Dove
VESP	Vesper Sparrow (Threatened)	NOHA	Northern Harrier
AMGO	American Goldfinch	NOMO	Northern Mockingbird
AMRO	American Robin	RTHA	Red-tailed Hawk
BAOR	Baltimore Oriole	RWBB	Red-winged Blackbird
BARS	Barn Swallow	SASP	Savannah Sparrow
BHCO	Brown-headed Cowbird	TRES	Tree Swallow
CHSP	Chipping Sparrow	EAPH	Eastern Phoebe
COGR	Common Grackle	RSTO	Eastern Towhee
EABL	Eastern Bluebird	GBHE	Great Blue Heron
EAKI	Eastern Kingbird	KILL	Killdeer

3.9 Cultural Resources

There are no cultural resources remaining at the proposed project location as it is a disturbed site and has been since World War II. Any cultural resources that may have been in place will have been disturbed or destroyed decades ago.

3.10 Geology and Soils

In general, soils in the vicinity of MMR are sandy and permeable and permit rapid groundwater movement (approximately one to two feet per day). The Sagamore Lens is recharged, or replenished, by rainwater that seeps through the sandy soil into the aquifer. The highly permeable nature of the sands and gravels underlying the area allows for rapid infiltration of rainfall, which minimizes surface water runoff except on extreme slopes.

The unconsolidated overburden sediment beneath MMR and adjacent areas was deposited during late-stage Pleistocene glaciation. The majority of the MMR and the areas to the south between the MMR boundary and Vineyard Sound lie within a broad glacial outwash plain referred to as the Mashpee Pitted Plain (MPP). The MPP is comprised of poorly graded, medium to coarse-grained sand with well-graded gravel, and occasional local, discontinuous lenses of fine-grained silty sands, silts, and clays. Underlying the MPP in most areas are silty glaciolacustrine sediments and basal till, although in some areas coarse-grained MPP deposits directly overlie bedrock. The landfill is located within the MPP, however the cap placed over the Post 1970, 1970 and the kettle hole cells is designed to be impermeable and prevent the infiltration of precipitation through the waste in the landfill. The cap is not representative of the soils that are typical to the MMR.

3.11 Socioeconomics

The landfill site itself is stable and requires very little maintenance or monitoring. In all, it provides less than one man-month of employment including testing, monitoring/inspections, technical evaluation, and grassland maintenance.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Land Use

Proposed Action: The primary change in land use will be that the currently under-utilized capped landfill resource will be passively used as a productive source of up to 6 megawatts of renewable electricity. The principle impact within the relevant 60 acres (and the access to it) would be that the acreage may no longer be suitable habitat for the identified endangered bird species when the SPVS is installed and operated. Details of the impact to biological resources are given below in section 4.7 and in the attached *Otis ANGB Solar Array project Grasslands Mitigation Plan*.

In addition, there will be transformer/inverter equipment installed within the site. As the SPVS will be surface mounted, there will be no physical change to the landfill cap itself. Installation of the array will still allow testing and monitoring of the landfill in accordance with AFCEC's management plan.

Alternative Action 1: Development of an SPVS would impact greater areas (collective parcels) on locations on the installation that would tie up these parcels and area for 20 years within the more developed Otis ANGB cantonment areas that are best suited as options for any projected business or administrative facilities development and future core mission expansion requirements.

Alternative Action 2: Similar issues and concerns exist with an SPVS on these parcels as noted in Alternative 1. This action would site the solar arrays on existing protected grassland habitat, requiring an environmental and habitat mitigation plan after consultation and agreement with NHESP.

No-Action Alternative: If no action is taken, the landfill will continue as it is now - a wasted resource. Otis ANGB will not realize the energy cost savings through cheaper electricity and will not be able to comply with Energy Policy Act of 2005 and Executive Orders 13423 and 13513.

4.2 Air Installation Compatible Use Zone

No part of the proposed or alternative actions would employ or influence airspace operations or air traffic management at or around the MMR. The solar panels of the proposed action would have a non-glare surface and would not affect aviation activities. Construction, operation, and maintenance of the SPVS would not attract wildlife to the areas and thus, would not increase the bird/wildlife aircraft strike hazard. There would be no impact to flight safety under the proposed action. Alternative actions 1 and 2 would require additional analysis to determine any effects to aviation.

4.3 Air Quality

All the alternatives, save for the No-Action Alternative, would have a positive impact on air quality typically associated with renewable energy sites, and some short term negative impacts from construction and decommissioning (in 20 years) such as diesel fumes and dust. The landfill no longer releases gasses or other contaminants, so there is no air quality threat to construction or maintenance personnel.

In 1993, the EPA established the General Conformity Rule which mandates that the federal government ensure conformity to an approved Clean Air Act implementation plan for all federally funded work and facilities. De minimis emissions are the total direct and indirect emissions that fall below criteria specified in the Rule. The EPA provides a list of actions deemed as clearly de minimis in Title 40 CFR 93.153(c)(2).

According to the Rule and Title 40 CFR 93.153(c)(2), emissions of dust during construction of the proposed project are considered de minimus. The solar installation creates no other emissions once installed and operating.

Under the No-Action Alternative, Otis ANGB will continue to be reliant on fossil-fuel generated electricity, contributing to the emission of carbon dioxide and other pollutants into the atmosphere and there would be no change to the status quo in relation to the General Conformity Act.

4.4 Noise

For the proposed action, as well as Alternative Actions 1 and 2, there would be minor noise impact during the construction phase to include truck and other vehicular noise on the site and along Connery Ave and other base roads. The solar panels themselves are silent. There will be low volume humming from the inverters, with a typical value from this type of equipment of 64dB at 50 feet, reducing to 40 dB at 800 feet. This noise will be inaudible at any of the nearby activity locations.

There is no noise impact associated with the No-Action Alternative.

4.5 Base Utilities

Proposed Alternative: The solar array will connect to the base grid on either the North Feeder or East Feeder A. It will be the contractor's responsibility to complete a full electrical survey and engineering plan, to be approved by the 102nd CES, for the interconnection, and must include appropriate electrical protection to prevent any damage from the array to the base infrastructure, and vice-versa. In the event of an outage of the commercial power supply, the array will automatically go off line immediately. At times the array may produce more power than the Otis ANGB grid demands. In those instances, the surplus power will feed back through the Otis transformer into the NStar distribution system. This surplus will be metered and Otis will receive full retail offset credit on the Hess and NStar commercial power bills. No utility services or facilities will be provided to the site by Otis ANGB.

Alternative Actions 1 and 2: These actions would require the same engineering survey, interconnections, protection systems and inverters as the proposed solution. However, because the sites for both alternatives are distant from each other, they would each require either 3 or 4 times as many interconnections to the base grid with associated hardware, inverters, and protection systems, increasing the cost of the installations and reducing the economic benefit.

No-Action Alternative: There is no impact to the base utilities with this alternative.

4.6 Water Resources

There will be no impact to water resources from any of the alternatives. For the Proposed and Alternative Actions 1 and 2, the operator may choose to wash the SPVS panels with water, but this is not required. The amount of water used would not be appreciable when compared to normal rainfall in the area, would not introduce any contaminants, and would have no impact to existing drainage patterns. The No-Action Alternative would have no impact on base water resources.

4.7 Biological Resources

Proposed Alternative: The NHESP has determined that this action would result in a “take” of habitat of protected migratory bird species (NHESP letter included in appendix); in this case, grasslands required by three migratory bird species, listed by the Massachusetts NHESP as follows:

- Upland Sandpiper (Endangered)
- Vesper Sparrow (Threatened)
- Grasshopper Sparrow (Threatened)



Figure 5: The Upland Sandpiper

Listed by the Massachusetts NHESP as Endangered. Unusual for sandpipers, the Upland prefers grassland for nesting, rather than rocky shoreline. If approved, construction of the solar array will be postponed until after the birds have left for their 6,000 mile migration to Argentina.

Figure 6: The Vesper Sparrow

Listed by the Massachusetts NHESP as Threatened, the Vesper is usually the first species to occupy new grasslands such as landfills and abandoned farms. It breeds in northern North America and winters in the South and Mexico.



Figure 7: The Grasshopper Sparrow

Listed by the Massachusetts NHESP as Threatened. As its name suggests, grasshoppers are its primary food. Found all across the Eastern United States in the summer, and prefers the warm climate of the American South and Mexico to harsh New England winters.

Through early consultation with the NHESP, Otis ANGB and the MMR have agreed to a habitat mitigation plan to offset the potentially disturbed habitat (Otis ANGB Solar Project Grasslands Mitigation Plan, October 2012, attached). The plan commits the MMR to replacing the landfill area with additional parcels of land, all contiguous to existing protected grasslands habitat. As a condition of the plan, the proposed lease and the construction of the array will not take place between May and August, so as not to disturb the birds and their offspring during nesting season.

To verify the impact to these and other bird species, the 102nd IW has agreed to partner with the NHESP to undertake periodic wildlife studies within the project area to see what effect, if any, the presence of a solar array has on the breeding habits of these species. This research may affect other solar array installations in the state by providing more comprehensive knowledge around this kind of habitat disturbance, allowing for either more relaxed or more stringent, requirements for future projects.

As per consultation with the Massachusetts DFW and the US DFW, no other migratory birds or animal species are known to be affected by the proposed project.

All Other Alternative Actions: The parcels considered for this alternative are not protected and no protected species are known to inhabit these areas. However, in order to minimize shadowing of some of the panels, some trees bordering some of the sites may need to be removed.

4.8 Cultural Resources

As this is a previously highly-disturbed site, no impact to cultural resources is anticipated from the proposed action. In accordance with DoD instructions related to interactions with federally recognized tribes, local Wampanoag tribes of Mashpee and Aquinnah have been notified of the proposed alternative action by letter. The presence of cultural resources at the alternative locations is unknown and would require an archeological survey to confirm.

4.9 Geology and Soils

The installation of the array and associated construction and decommissioning activities will have no impact on geology or soil condition. No impact would be expected with any of the alternatives.

4.10 Socioeconomics

In their July 2011 feasibility study, NREL estimated that construction of the solar array will create up to 375 local jobs. Because the array requires little maintenance, only .60 sustained jobs will be created. This would be the case for the Proposed and Alternative Actions 1 and 2. The No-Action Alternative would have no impact on the local socioeconomics.

4.11 Safety and Occupational Health

Effects to health and safety would be minimal. Under the proposed action, there would be an increased construction safety risk associated with all similar construction activities on the project site and Connery Avenue. The proposed action is located outside all airfield clear zones and behind a security fence which renders it inaccessible to any non-authorized personnel. The contractor would be responsible for implementing a site-specific Health & Safety Plan for this project.

Effects by the alternative proposals would be the same as described under the proposed action.

4.12 Hazardous Materials/Waste and Solid Waste

No use of hazardous materials is anticipated during the construction, operations, maintenance or decommissioning phases of either the proposed or alternative actions of this project. Use of hazardous materials in the manufacture and disposal of solar panels and associated equipment is minimal and safe disposal methods are in place within the industry. Many types of panels can be recycled reducing their impact on the environment at the end of their useful life. The contractor will be responsible for following all relevant regulations regarding the disposal of all project material at the end of the contract.

5.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Proposed Action: An insignificant amount of irreversible resource commitments and no irretrievable resource commitments would be required for the proposed action. Irretrievable resources necessary to accomplish the proposed action would primarily be fossil fuels for transport of construction items, as well as for operation of heavy equipment used to construct the SPVS. However, operation of the SPVS would ultimately produce a renewable energy source that would negate the amount of fossil fuels used to construct the system. Ultimately, the renewable power generated by operation of the SPVS would more than counterbalance the minimal demands on non-renewable energy resources required for vehicles used for construction and maintenance.

Alternative Actions 1 and 2: Resource commitment would be the same as described for the proposed action.

No-Action Alternative: There would be no use of irreversible or irretrievable resources for construction and maintenance activities under the no-action alternative. However, the MMR would continue to use power generated from non-renewable resources until such time as an alternative method of acquiring renewable energy sources to augment the current power supply would be implemented. No action at this time would cause greater irreversible and irretrievable commitment of fossil fuels than would the proposed and alternative actions.

6.0 CUMULATIVE IMPACTS

Proposed Action: The primary impact to the environment would be a positive one that supports the Energy Policy Act of 2005 and Executive Orders 13423 and 13513 and reduces Otis ANGB's dependence on commercial power. Because the solar photovoltaic system would provide Otis ANGB with up to 25% of its power requirements, there would be a cumulative reduction in the depletion of non-renewable resources used to generate power over ensuing decades.

The installation would also provide valuable data on the performance of solar power generation on Cape Cod, which could help inform other development projects in the region. Specifically, the US Coast Guard is planning to install a similar SPVS in 2013, also on the MMR. The Coast Guard will not use this power at the MMR but, through a net metering agreement with NStar, they will use the power to offset the utility bills of several other Coast Guard facilities within the NStar territory. There are also three smaller SPVS installations very near the base that are being planned by private developers. All of these solar installations will substantially increase the amount of renewable energy generated on Cape Cod. This will lighten the electrical load on the transmission lines feeding from the mainland and could also result in improvements to the local environment by requiring the Sandwich Power Plant, located alongside Cape Cod Canal, to run less frequently.

In economic terms, the PPA would provide Otis ANGB with a fixed, guaranteed lower price for power which will save the US taxpayer up to \$13 million over the life of the contract.

Because the proposed project location is within the boundaries of the MMR, quite a distance from most civilian activity, the impact to the local community will be minimal. Dust and noise from the construction is unlikely to be noticed very far from the construction site. There may be some minimal extra dust on the

roads leading to the MMR as trucks haul ballast stone and other materials to the site, but this would be a very small amount.

The only two roads connecting Cape Cod and the mainland are Route 28, crossing the Cape Cod Canal in the west, and Route 6, crossing the canal in the east and providing the primary trunk road to most of the Cape. These roads become heavily congested during the summer tourist season, primarily on weekends, as traffic approaches the bridges from both directions. This project would bring no additional truck or equipment traffic to the Cape during this busy time as construction of this project is prohibited during the birds' nesting season, which matches perfectly with the summer tourist season. During operations, the SPVS will require very little maintenance so there is no long term impact to the community.

Alternative Actions 1 and 2: Cumulative impacts would be the same as described for the proposed action.

No-Action Alternative: The no-action alternative would cause no cumulative impacts to the environment from construction and maintenance of an SPVS. However, until such time as use of an alternative renewable energy source could be developed and implemented, the non-renewable resources used to produce power would not be curtailed at the MMR. This would add to the increasing worldwide consumption of non-renewable energy resources.

7.0 CONSULTATION AND COORDINATION

- Massachusetts Special Military Reservation Commission (SMRC)
- U.S. Fish and Wildlife Service
- Massachusetts Division of Fisheries and Wildlife
- Massachusetts National Heritage and Endangered Species Program
- Military Civilian Community Council
- Environmental Management Commission
- AFCEC MMR IRP Management Team
- MMR Energy Committee
- Joint Oversight Group (MAANG, MAARNG, USAF PAVE PAWS, and USCG)
- Massachusetts Historic Commission
- Bourne Historic Commission
- Bourne Conservation Commission
- Tribal Historic Preservation Officers – Wampanoag Tribes of Mashpee and Gay Head-Aquinnah
- Environmental Protection Agency, Region 1
- Massachusetts Department of Environmental Protection

List of Preparers

- Captain Shawn Doyle, 102nd CES, Director of Environmental Operations, Otis ANGB
- Rose Forbes, PE, AFCEC Installation Restoration Program, Otis ANGB
- Thurman Deane, 102nd CES, Deputy Director of Environmental Operations, Otis ANGB

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Nexamp *The Guide to Developing Solar Photovoltaics at Massachusetts Landfills*. Unknown.

Appendices

- Otis ANGB Solar Project Grasslands Mitigation Plan, October 2012
- Letter of Determination, Mass Division of Fisheries and Wildlife, dated 1 Mar 2013
- Consultation Letters and Replies

Otis Air National Guard Base

Solar Array Project Grasslands Mitigation Plan

October 2012



Prepared For

The Massachusetts Division of Fisheries & Wildlife
Natural Heritage Endangered Species Program
Westborough MA 01581

Prepared By

102nd Civil Engineering Squadron
102nd Intelligence Wing
Otis Air National Guard Base MA 02352

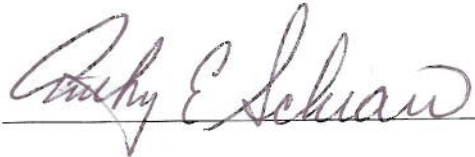
Otis Air National Guard Base
Solar Installation Grasslands Management Plan

We are pleased to present this plan for the expansion and maintenance of managed grassland habitat, as well as the transfer of land from Otis ANGB to the Massachusetts Division of Fisheries and Wildlife, with respect to the planned landfill solar array project. We are firmly committed to maintaining sustainable operations to the greatest extent possible here at Otis ANGB. That commitment includes making maximum use of our land resources for both renewable energy as well as wildlife preservation. The two are inextricably linked here due to the type of habitat we have, the importance of the resident wildlife species, and our desire to maximize our clean energy potential.

We would like to extend a heartfelt thanks to the Division of Fisheries and Wildlife, most especially the Natural Heritage and Endangered Species Program office, for their assistance in compiling the final plan as it reads here. This project has served to confirm the strength of our relationship and we look forward to working together in the future.



Patrick J. Cobb, Colonel, MA ANG
Commander
102nd Intelligence Wing



Anthony E. Schiavi, Colonel, MA ANG
Executive Director
Massachusetts Military Reservation

Executive Summary

This plan, created with the cooperation of the Massachusetts Department of Fisheries and Wildlife (the Division), Natural Heritage and Endangered Species Program (NHESP), spells out the commitments by the 102nd Intelligence Wing to mitigate the disturbance and use of grassland habitat in association with a planned solar array installation.

To offset the disturbed habitat, the 102nd Intelligence Wing agrees to maintain the 149 acre area known as Unit K, in its entirety, as grassland, according to the management requirements contained herein. The 102nd IW will add to the grassland management commitment 33 acres of new land which is contiguous to Unit K and generally bounded by General's Blvd, South Outer Road, and East Inner Road.

Additionally, the 102nd will declare a 133 acre parcel of land to the south of the base as excess, with the intention of transferring ownership to the Division. This land is not used by Otis Air National Guard Base and is currently leased to the NHESP as part of the Crane Wildlife Management Area. A 54 acre portion of this land will contribute toward this mitigation plan and is proposed to be converted to grassland by the Division. The remainder, 79 acres of forest, provides higher quality habitat for other state-listed species and is therefore not proposed to be converted to grassland. Because of this, it will not apply to the habitat offset in this plan. However, the Division has agreed to hold this portion "in reserve" as a credit toward any future development that may disrupt similar habitat.

This plan will remain in place for the duration of the 20-year solar array power purchase agreement. At that point both the solar array installation and this plan will be re-evaluated for further action.



Figure 1: Landfill, location of planned solar array

Table of Contents

Executive Summary	i
1. Solar Array Installation Project	1
Background and Description.....	1
Justification	1
Timeline	1
2. Landfill Area	2
Description.....	2
Solar Array Installation Areas	2
Species Concerned	3
3. Mitigation Offset Plan	4
Overview	4
Landfill Solar Array Site.....	4
Unit K	4
Current State of Unit K.....	4
Current Grasslands Management Commitments	5
Plan for Conversion to Grassland	6
New Land Contiguous to Unit K.....	6
Tract 5	6
4. Lifespan of this Agreement	8
Appendix.....	I

1. Solar Array Installation Project

Background and Description

The 102nd Intelligence Wing is pursuing a project to install a 4-6 Megawatt solar array on a former landfill site. The entire infrastructure of the array will be owned and operated by a third party supplier who will sell the energy produced to the 102nd IW through a Power Purchase Agreement (PPA).

The landfill site has been determined to be an excellent location for a solar project by the National Renewable Energy Laboratory. Due to its being a capped, managed landfill, the land has little value for other purposes. Because maintaining the integrity of the cap is crucial, the solar array will be surface mounted with no ground penetrations of any kind.

The life of the contract will be 20 years, after which the contract and condition of the hardware will be re-evaluated to either terminate the agreement or extend it. Upon termination, all solar panels, mounting hardware and supporting infrastructure will be removed and the land restored to grassland habitat subject to review and approval by the Massachusetts Division of Fisheries and Wildlife (the Division).

Justification

A preliminary economic analysis of the PPA shows a potential renewable energy gain of 123 MWh and an energy bill savings of up to \$6.8 Million over the 20 year life of the project. Even given a worst case scenario of no growth in conventional utility prices, a 2% increase in solar power cost per year, and an increase in interest rates to 8%, the PPA could still return up to \$4.9 Million.

Timeline

The project was originally to due to start construction in March 2013, with the array producing revenue generating power by July of that year. Adding time for this mitigation plan to be created, and recognizing the potential for threatened or endangered species to be nesting during our planned construction time, the construction timeline will be postponed until September 2013 or until there is no risk of disturbing nesting birds.

2. Landfill Area

Description

The landfill area is a 66 acre plot of land in a secure part of the Massachusetts Military Reservation that was used as a general landfill from the 1940s to the 1970s. Since 1995, it has been capped off and managed by the Air Force Civil Engineering Center (AFCEC), which continues to maintain responsibility for its management. The capped area is grassland consisting mostly of gentle slopes and large, relatively flat areas.

Solar Array Installation Areas

The solar array will be built on the grassy areas shown in Figure 2. The forested area is not related to the project. For reference purposes, the plot has been divided into areas referred to as Sites 1, 2 and 3.



Figure 2: Sites of Proposed Solar Array Installation

Species Concerned

Following is a list of all bird species found in the landfill site during the 26 June 2012 bird survey. The species at issue are the endangered Upland Sandpiper, and the threatened Vesper Sparrow and Grasshopper Sparrow.

Common Species Code	Species Name
UPSA	Upland Sandpiper (Endangered)
GRSP	Grasshopper Sparrow (Threatened)
VESP	Vesper Sparrow (Threatened)
AMGO	American Goldfinch
AMRO	American Robin
BAOR	Baltimore Oriole
BARS	Barn Swallow
BHCO	Brown-headed Cowbird
CHSP	Chipping Sparrow
COGR	Common Grackle
EABL	Eastern Bluebird
EAKI	Eastern Kingbird
EAPH	Eastern Phoebe
RSTO	Eastern Towhee
GBHE	Great Blue Heron
KILL	Killdeer
COLO	Common Loon
MODO	Mourning Dove
NOHA	Northern Harrier
NOMO	Northern Mockingbird
RTHA	Red-tailed Hawk
RWBB	Red-winged Blackbird
SASP	Savannah Sparrow
TRES	Tree Swallow

3. Mitigation Offset Plan

Overview

Installation of the solar array potentially disrupts habitat conducive to the species mentioned above, resulting in a prohibited “TAKE” of the state-listed grassland bird species. Because of this, alternative suitable land must be designated and converted so as to replicate the existing grassland habitat. Through agreement between the 102nd IW and the Division, the 102nd IW commits to maintain designated grassland habitat in accordance with the *OANGB Grassland Management Plan, 2002 (Revised 2008)*. The relevant excerpt from this plan is attached as an appendix.

The following parcels of land are designated as managed grassland habitat:

Landfill Solar Array Site

The solar array installation may not require all of the grassland of the landfill. Remaining grassland on the perimeter and between the rows of solar panels may still be suitable habitat. The 102nd IW will maintain these perimeter and inter-row areas in accordance with the grassland requirements as laid out in this plan.

Unit K

In accordance with the *OANGB Integrated Natural Resources Management Plan, December 2007*, (INRMP) the 102nd IW is committed to maintaining Unit K as a grassland (Figure 3). To date, part of Unit K has been managed as such, but not the entire parcel. As part of this plan, the 102nd IW commits to converting and maintaining the entire Unit K area in accordance with the INRMP.

Current State of Unit K

Unit K is currently in an intermediate state consisting of cultural grassland, managed grassland, and transitional (treed) grassland. There are remnant impervious surfaces scattered throughout the area. This material, up to 14 acres, is scheduled to be removed. The area is dominated by grass species including filiform fescue (*Festuca tenuifolia*), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), hairgrass (*Deschampsia flexuosa*), redtop (*Agrostis gigantea*), poverty grass (*Danthonia spiccata*), and Pennsylvania sedge (*Carex pennsylvanica*). The only common tree species are immature pitch pine and red cedar. Sweetfern (*Comptonia peregrina*) was found in dense thickets less than a meter in height, whereas bayberry (*Myrica pensylvanica*), blueberry, and scrub oak were present, but less common. Many non native and invasive species such as honeysuckle (*Lonicera* spp.), Asiatic bittersweet (*Celastrus orbiculata*), autumn olive (*Elaeagnus umbellata*), and spotted knapweed (*Centaurea maculosa*) occur in this grassland area.

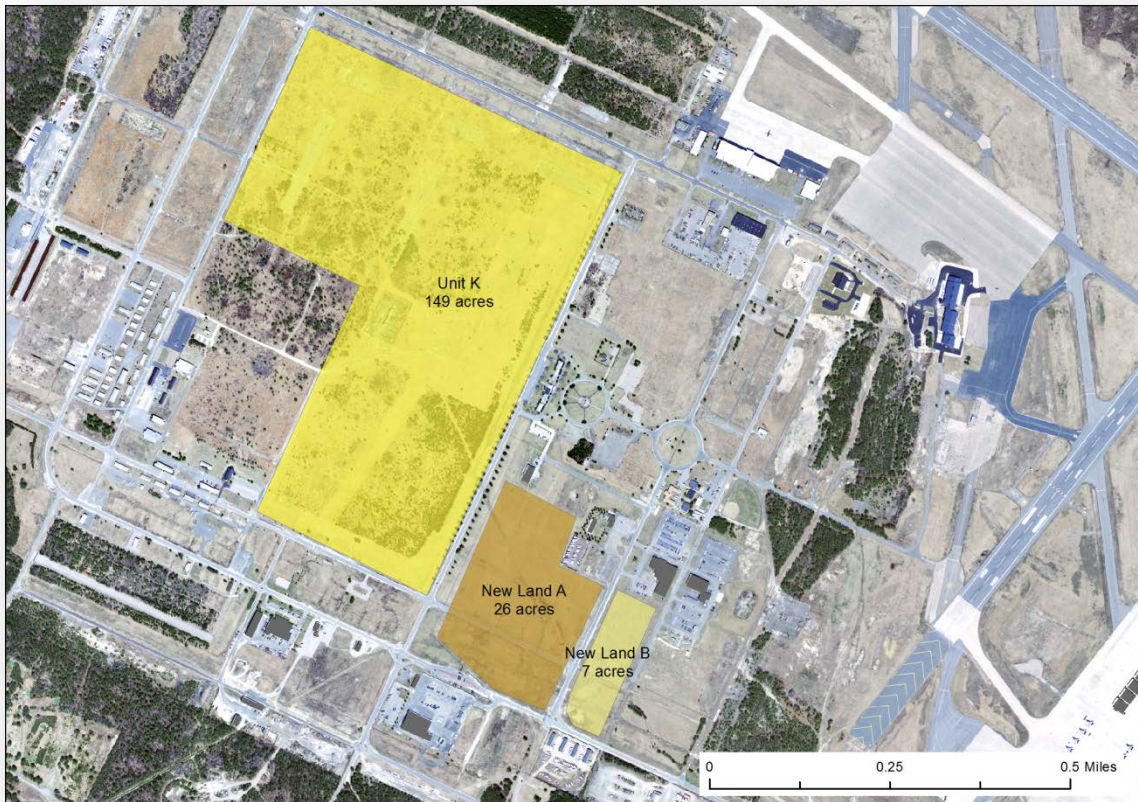


Figure 3: Aerial view showing Unit K as well as 33 acres of new land, Areas A and B, to the southeast.

Current Grasslands Management Commitments

Below is a summary of the commitments the 102nd IW has in relation to Unit K, as per the OANGB *Integrated Natural Resources Management Plan, December 2007*:

7.4.11 Unit K – Grassland Unit

1. Maintain all grassland areas outside the airfield fence in order to provide habitat for state-listed bird species and prevent areas from returning to forested lands.
2. Mowing to be accomplished IAW the Grasslands Management Plan 02, including but not limited to, not mowing the area during the period May 1 - July 31 of each year.
3. Clear grassland areas that are slowly succeeding to forest. Seed with native grasses and

4. *Maintain as grasslands IAW the Grasslands Management Plan 02, in order to provide habitat for state-listed bird species and prevent areas from returning to forested lands.*
5. *Particularly in Unit K, consider use of controlled burns for grassland management.*

Plan for Conversion to Grassland

The parcel has great baseline condition as a grassland area. Mechanical removal of trees, mowing, and prescribed fire are used in current maintenance activities as well as monitoring and removal of invasive species as practical. An increase in frequency of these management techniques would lead to a well managed grassland area. The 102nd IW will procure funding and resources to restore the entire Unit K area to the condition required above.

New Land Contiguous to Unit K

The 102nd IW will commit a new 33 acre parcel of land, contiguous to Unit K to the southeast, to be designated as grassland and managed as stated above (Figure 3). The land is nearly flat and is currently maintained to grassland standard.

Tract 5

Tract 5, as defined in the lease between the Special Military Reservation Commission (SMRC) and the Division, is a plot of land to the south of OANGB abutting the Crane Wildlife area (Figure 4). It is currently under a 20 year lease to the Division, due to expire in 2019. As part of this plan, OANGB will declare this parcel surplus to the SMRC, proposing that ownership transfer to the Division, thereby giving up all rights to it in perpetuity with one proviso. The area relevant to this project is the 54 acre eastern portion bounded on the north by Kittredge Road, on the west by Turpentine Road and to the south by Crane Wildlife Area. Kittredge Road itself will remain the property of OANGB.

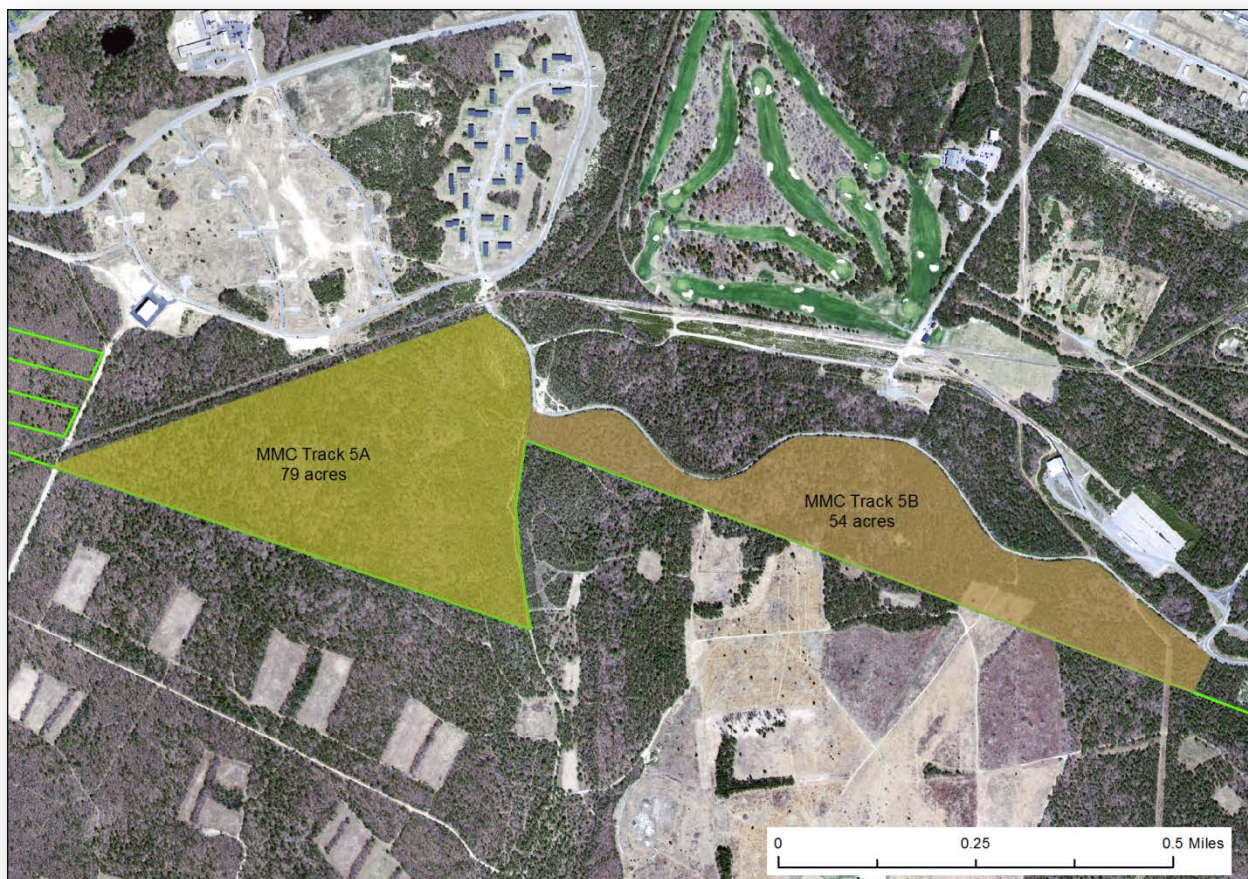


Figure 4: Tract 5. Section 5A is to be banked as credit toward future development on similar habitat. Section 5B is part of this mitigation plan.

The western 79 acre triangular section of Tract 5 is included in the handover of ownership but is not a part of this mitigation plan because it is unsuitable for conversion to grassland. However, the 102nd expressed an interest in declaring the entire parcel surplus rather than subdividing it. The Division agreed to hold this land “in reserve” to be credited toward any future development plans affecting state-listed species for which the habitat at the time is a suitable mitigation. This area is bounded by Crane Wildlife Area, the railroad track, and Turpentine Road.

The proviso to the handover of Tract 5 is that access to the monitoring wells owned by AFCEC and the US Geological Survey will remain unimpeded as long as required by those two agencies (Figure 5).

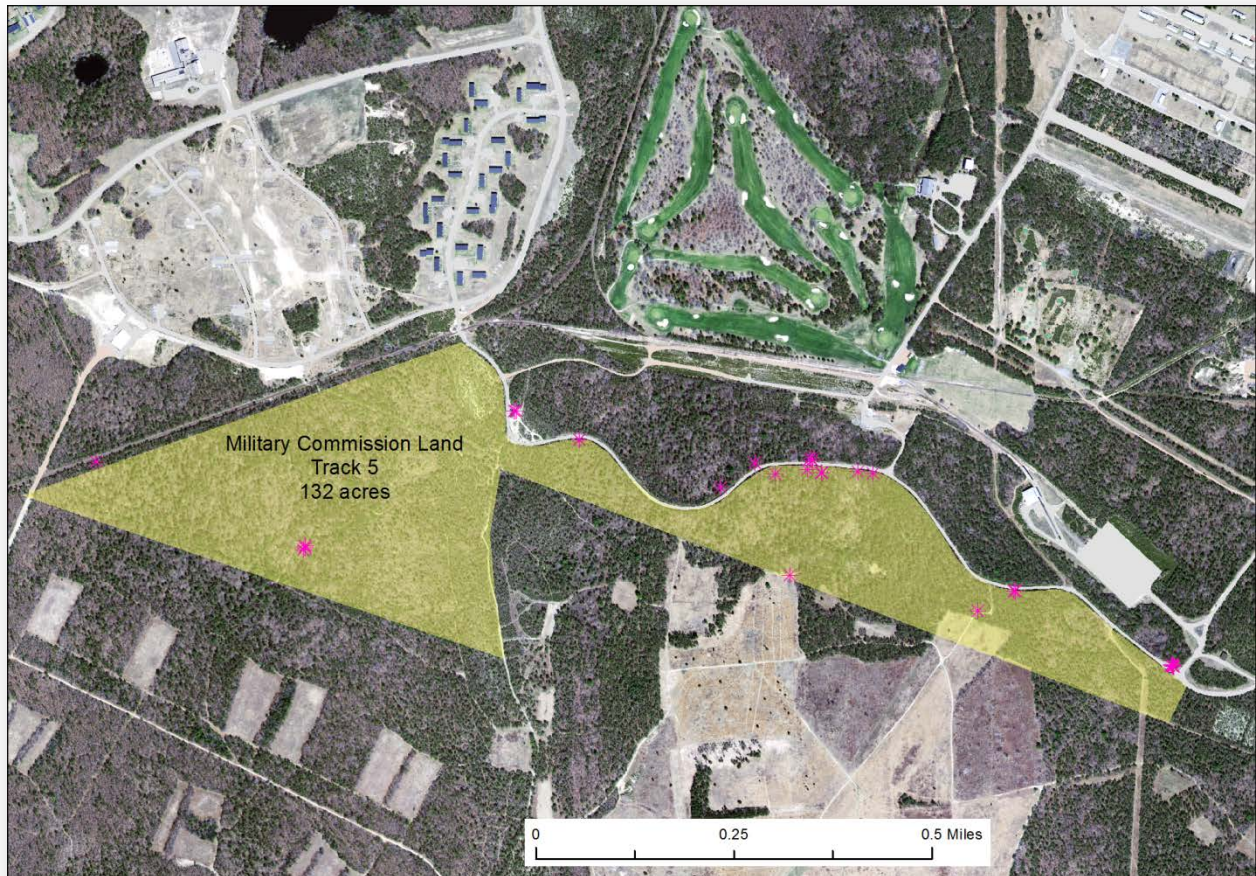


Figure 5: Tract 5 showing locations of sampling wells managed by AFCEC and USGS. Access to these wells will be maintained as long as required by the owning agencies.

4. Lifespan of this Agreement

This agreement shall be valid for the 20 year life of the solar array PPA installation, except for the transfer of ownership of Tract 5, which is in perpetuity. At the end of the contract period the PPA and array will be re-evaluated to decide whether to terminate the contract and return the ground to its previous condition or to take some other action deemed appropriate at that time. The re-evaluation of this plan, in cooperation with the Division, will be part of that activity. Any land restoration plans will have to be approved by the Division.

Appendix

Excerpt from the OANGB *Grassland Management Plan 2002 (revised 2008)*, defining the requirements of OANGB managed grasslands:

5.0 MANAGEMENT PLAN FOR MANAGED GRASSLAND AREA

5.1 RESTORATION ACTIVITIES

The primary goal of the Otis ANGB Grasslands Management Plan is to restore that portion of the grassland area on Otis which has become overgrown to its early successional state.

This area of approximately 161.57 acres is bounded: on the east by Generals Boulevard; on the west by West Inner Road; on the south by South Inner Road; and on the north by Richardson Road.

It is expected that it will take several years to bring this area back to an early successional state. ...

5.2 MANAGEMENT AND MAINTENANCE ACTIVITIES

...

To successfully manage these areas, the following provisions will apply to the Managed Grassland Area:

a. All activities and land uses are normally restricted from this area.

b. Restricted activities include the following:

- 1) Mowing between May 15^t and July 31st of each year (to accommodate the period of nesting and brood-rearing by the state-listed grassland birds)*
- 2) Vehicle traffic in areas other than established roads(excluding activity by personnel associated with management of the area)*
- 3) Foot traffic in areas other than established roads (excluding activity by personnel associated with management of the area)*
- 4) Camping or bivouacking(This would not preclude setting up military equipment in the area (such as temporary communications towers) without actual camping/bivouacking of personnel.)*
- 5) Recreational activities, including team sports that require playing fields*

c. The grasslands should be maintained by periodic mowing or burning either before May 1st or after July 31st (the breeding season for grassland birds).

d. The grass in the managed grassland area should be mowed to a height of 14 inches.

e. One-half of the area should be mowed each year to provide vegetation cover of varying heights; and burned every three or four years to reduce the amount of underbrush growth accumulated on the ground.

NOTE: The periodic burning and mowing of the managed grassland area will serve to maintain the ecosystem by preventing colonization by trees and shrubs.

f. Regular mowing of 20 - 50 ft wide strips along roads in this area may occur throughout the year.

g. Non-native plants (e.g., Asiatic bittersweet, multiflora rose, Japanese Honeysuckle) within the Managed Grassland area will be eradicated when possible and within available federally-provided resources by current best management practices including, but not limited to, stump and paint application of herbicide and mechanical removal.

h. Fragmentation of the managed grasslands area, which reduces the probability of attracting grassland birds (particularly highly area-sensitive species such as the Upland Sandpiper) will be avoided. When possible and within available federally-provided resources, the sources of fragmentation (e.g., roads, groves of trees, hedgerows) should be removed. Hedgerows dominated by woody vegetation taller than 10 ft (3 m) or wider than 16 feet (5 m) will also be removed when possible.

i. This area will be managed to provide a diversity of grassland habitats.

j. When managed grasslands habitat on Otis ANGB border a forested habitat, a more natural, open or "feathered" edge between grassland and forest will be encouraged, rather than maintaining sharp, straight contrasting walls of woody vegetation.

k. If mowing needs to be accomplished to accommodate parking for air shows or for other military mission needs:

1) Concentrate the mowing outside of the mid-May to mid-July timeframe, the peak nesting period for the majority of grassland breeding birds.

2) Walk the area to be mowed to identify any specific nests, roping off a safe area around any nests. The roped-off area will remain unmowed. Place an appropriate off-limits sign at the roped-off area.

3) Use an annual rotational mowing system in which some sections are left unmowed each year; as a mowing cycle of 3 to 5 years (depending on site conditions) is beneficial especially for species that need bushes or short trees for perches.

4) Use a cutting height of 3 - 5 inches for safety purposes.

5) Favor early spring mowing (March, early April) over late Summer-fall (August-October) mowing to provide winter habitat for grassland birds (e.g., Northern Bobwhite, Northern Harrier, Short-eared Owl). This will allow time for regrowth and seed production.

NOTE: It is the standard policy of the 102nd Intelligence Wing not schedule air shows between the May 1st through July 31st time frame.

l. Use native warm-season grasses which grow during the summer rather than grasses which grow during the cooler spring and fall months. (Warm-season grasses grow in clumps each surrounded by relatively open areas that provide a network of travel lanes for birds; whereas cold-season grasses form more uniformly dense stands, leaving little room for birds to move about.)

m. Following are recommendations regarding management of native warm-season grasses:

1) Monotypic stands do not provide adequate habitat for birds, especially in the form of vegetative structure. It is more beneficial to plant a mixture of tall and short grasses, which result in a mosaic of vegetative heights.

a) Recommended tall grasses include: big bluestem, Indian grass, switch grass, and side-oats gama.

b) Recommended short grasses include little bluestem and broomsedge. Because native warm-season grasses vary in soil and moisture requirements, some of the grasses will become dominant in some fields, or parts of larger fields, and other grasses in other fields or parts of fields, depending on soil moisture and fertility. As a result, the habitat will become more diverse and of greater benefit to birds. To further increase the diversity of the vegetation, native forbs can be encouraged (e.g., Butterfly Weed). These will help attract insects, which are a vital protein source for growing nestlings.

a) Of these three practices, prescribed burns generally provide the most benefit to grassland bird communities. Burns should be conducted in early spring (March-early April) or late fall (October- November). In grasslands larger than 100 acres (40 ha), prescribed burns should be conducted on an annual rotation in which 20-30 percent of the total grassland area is burned

during a single year. On smaller grasslands, annual burns may represent a larger percentage of the total grassland area, but should not exceed 50-60 percent. Light grazing (leaving more than 40 percent of vegetation over 10 in, or 25 cm, tall) or moderate grazing (leaving 20-40 percent of vegetation over 10 inches tall) can benefit grassland birds and help maintain native warm-season grass communities. The best practice is to use a rotational system in which some sections are lightly grazed while others are left idle.

D. Tall trees (more than 10ft, or 3 m, in height) and snags should be removed from the parts of the managed grasslands that are more than 300 feet (90 m) from the grassland edge. If not removed, these structures may provide observation perches for avian nest predators or for Brown-headed Cowbirds scouting for host-species' nests to parasitize. However, a few scattered small trees throughout the area can improve habitat for species such as Field Sparrows and American Kestrels. Within a regional context, it is probably best to provide a diversity of grassland habitats, ranging from prairie-like areas free of woody vegetation to lightly treed, savannah-like grasslands.

o. Human disturbances to the managed grasslands will be minimized, especially during the nesting season.

p. Garbage and trash collection facilities and containers will be kept away from the managed grasslands area as they can attract unwanted concentrations of predators.

q. Modification or amendments to these procedures for the managed grassland area will be made as needed and appropriate.



DEPARTMENT OF THE AIR FORCE
102D INTELLIGENCE WING (ACC)
MASSACHUSETTS AIR NATIONAL GUARD
OTIS AIR NATIONAL GUARD BASE MASSACHUSETTS

RECEIVED

APR 01 2013

MASS. HIST. COMM

54024

27 March 2013

102CES/CE
971 South Outer Road
Otis ANG Base MA 02542-1330

Massachusetts Historical Commission
ATTN: Ms. Brona Simon
220 Morrissey Boulevard
Boston MA 02125

SUBJECT: Project Notification for a Landfill Solar Array at the Massachusetts Military
Reservation (MMR), MA

Dear Ms. Simon:

The 102 Intelligence Wing (102nd IW) located at Otis Air National Guard (ANG) Base at the Massachusetts Military Reservation (MMR) on Cape Cod, MA is proposing to construct and operate up to a six megawatt (6 MW) solar array on the closed base landfill. The solar array project will be awarded to a solar developer under a power purchase agreement. The power produced by the solar array will be used by the Otis ANG Base to offset the power consumption, and associated air emissions, of the 102 IW mission. The 102nd IW respectfully requests a review of this proposed project by the Massachusetts Historical Commission. A brief description of the project scope and location is attached.

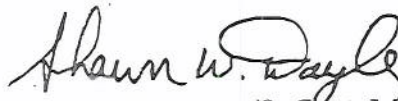
A feasibility study (FS), which was funded by the Environmental Protection Agency and describes the basic project proposal, was conducted by the National Renewable Energy Lab (NREL) for this project and is available at <http://www.nrel.gov/docs/fy11osti/49417.pdf>. The solar array project is proposed for the former base landfill which is located on Connery Avenue in the town of Bourne, MA on MMR. The portion of the landfill under consideration for the solar array consists of approximately 60 acres which was capped in 1995. The landfill is a regulated site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and is managed by the Air Force Civil Engineer Center (AFCEC). The area proposed for the solar array has been previously disturbed through the use as a landfill, which was subsequently capped. As part of post closure requirements, a vegetative surface is maintained on the cap to prevent erosion and encourage evapotranspiration. The cap is mowed once a year to prevent tree and/or shrub growth. Trees and/or shrubs are not desired on the landfill as their root systems could impact the integrity of the cap.

As discussed in the NREL FS, the array installation will include ballasted solar panels to prevent impacts to the integrity of the landfill cap, similar to other solar arrays installed on landfill caps. The Massachusetts Department of Environmental Protection (MassDEP)

encourages the post-closure use of landfills for renewable energy projects as long as the use will not compromise the environmental protection afforded by the landfill cap and closure. MassDEP has developed guidance including a fact sheet entitled; "Developing Renewable Energy Facilities on Closed Landfills" which is available at <http://www.mass.gov/dep/energy/landfill.htm>.

Thank you for your assistance. We would appreciate a response by 10 April 2013 if you have any questions regarding the proposed project or the enclosed materials. Please contact me at 508-968-4960; email shawn.doyle@ang.af.mil.

Sincerely,



SHAWN W. DOYLE, Capt, MA ANG
Chief, Environmental Management

Attachment:

Otis ANGB Solar Array Project Brief

After review of MHC's files and the materials you submitted, it has been determined that this project is unlikely to affect significant historic or archaeological resources.



MHC#PC54024
Edward L. Bell 08 April 2013 Date
Deputy State Historic Preservation Officer
Massachusetts Historical Commission



DEPARTMENT OF THE AIR FORCE
102D INTELLIGENCE WING (ACC)
MASSACHUSETTS AIR NATIONAL GUARD
OTIS AIR NATIONAL GUARD BASE MASSACHUSETTS

18 Mar 2013

102 CES/CEV
971 South Outer Road
Otis ANG Base MA 02542

Mr. Thomas R. Chapman
Supervisor
New England Field Office
U.S. Fish and Wildlife Service
U.S. Department of the Interior
70 Commercial Street, Suite 300
Concord, NH 03301-5087

Subject: Project Review Request for a Landfill Solar Array at the Massachusetts Military Reservation (MMR), MA

Dear Mr. Chapman:

The 102 Intelligence Wing (102nd IW) located at Otis Air National Guard (ANG) Base at the Massachusetts Military Reservation (MMR) on Cape Cod, MA is proposing to construct and operate up to a six megawatt (6 MW) solar array on the closed base landfill. The solar array project will be awarded to a solar developer under a power purchase agreement. The power produced by the solar array will be used by the Otis ANG base to offset the power consumption, and associated air emissions, of the 102 IW mission.

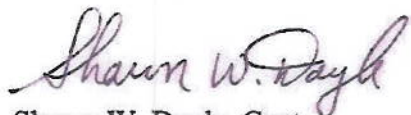
The 102nd IW respectfully requests a review of this proposed project by the U.S. Fish and Wildlife Service for potential impacts to, or concerns regarding, federally-listed endangered and threatened species and their habitats on or in the vicinity of the proposed project site. The MA Army National Guard Natural Resources Office has conducted annual bird surveys at the landfill over the past several years. No federally recognized threatened or endangered species have been identified at the landfill; however, three state listed threatened and endangered bird species have been identified. Due to the presence of the state listed species, a consult with the Massachusetts Natural Heritage and Endangered Species Program (MANHESP) was initiated and has been completed (Attachment 1).

A feasibility study (FS), funded by the Environmental Protection Agency, was conducted by the National Renewable Energy Lab (NREL) for this project and is available at <http://www.nrel.gov/docs/fy11osti/49417.pdf>. The solar array project is proposed for the former

base landfill which is located on Connery Avenue in the town of Bourne, MA on MMR. The portion of the landfill under consideration for the solar array consists of approximately 60 acres which was capped in 1995. The landfill is a regulated site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and is managed by the Air Force Civil Engineer Center (AFCEC). The area proposed for the solar array has been previously disturbed through the use as a landfill, which was subsequently capped. As part of post closure requirements, a vegetative surface is maintained on the cap to prevent erosion and encourage evapotranspiration. The cap is mowed once a year to prevent tree and/or shrub growth. Trees and/or shrubs are not desired on the landfill as their root systems could impact the integrity of the cap.

As discussed in the NREL FS, the array installation will include ballasted solar panels to prevent impacts to the integrity of the landfill cap, similar to other solar arrays installed on landfill caps. The Massachusetts Department of Environmental Protection (MassDEP) encourages the post-closure use of landfills for renewable energy projects as long as the use will not compromise the environmental protection afforded by the landfill cap and closure. MassDEP has developed guidance including a fact sheet entitled; "Developing Renewable Energy Facilities on Closed Landfills" which is available at <http://www.mass.gov/dep/energy/landfill.htm>.

Thank you for your assistance. If you have any questions regarding the proposed project or the enclosed materials please contact me at (508) 968-4960 or at email shawn.doyle@ang.af.mil.



Shawn W. Doyle, Capt
Massachusetts Air National Guard
Chief, Environmental Management
102nd CES/CEV

Attachment:
MANHESP Project Review and Take Letter



United States Department of the Interior



FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
<http://www.fws.gov/newengland>

April 24, 2013

Reference: Project Location
Landfill solar array project Massachusetts Military Reservation, Bourne, MA

Shawn W. Doyle, Captain
Massachusetts Air National Guard
102D Intelligence Wing (ACC)
Otis Air National Guard Base, MA 02542

Dear Captain Doyle:

This responds to your recent correspondence requesting information on the presence of federally listed and/or proposed endangered or threatened species in relation to the proposed activity referenced above. These comments are provided in accordance with the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531, *et seq.*).

Based on information currently available to us, no federally listed or proposed, threatened or endangered species or critical habitat under the jurisdiction of the U.S. Fish and Wildlife Service are known to occur in the project area. Preparation of a Biological Assessment or further consultation with us under section 7 of the Endangered Species Act is not required. No further Endangered Species Act coordination is necessary for a period of one year from the date of this letter, unless additional information on listed or proposed species becomes available.

To obtain updated lists of federally listed or proposed threatened or endangered species and critical habitats, it is not necessary to contact this office. Instead, please visit the Endangered Species Consultation page on the New England Field Office's website:

www.fws.gov/newengland/endangeredspec-consultation.htm (accessed January 2013)

On the website, there is also a link to procedures that may allow you to conclude if habitat for a listed species is present in the project area. If no such habitat exists, then no federally listed species are present in the project area and there is no need to contact us for further consultation. If the above conclusion cannot be reached, further consultation with this office is advised. Information describing the nature and location of the proposed activity that should be provided to us for further informal consultation can be found at the above-referenced site.

Shawn W. Doyle, Captain
April 24, 2013

2

Thank you for your coordination. Please contact Brett Hillman of this office at 603-223-2541, extension 34, if we can be of further assistance.

Sincerely yours,

A handwritten signature in dark ink, appearing to be "T. Chapman", with a long horizontal flourish extending to the right.A handwritten signature in dark ink, appearing to be "T. Chapman", with a long horizontal flourish extending to the right.

Thomas R. Chapman
Supervisor
New England Field Office



DEPARTMENT OF THE AIR FORCE
102D INTELLIGENCE WING (ACC)
MASSACHUSETTS AIR NATIONAL GUARD
OTIS AIR NATIONAL GUARD BASE MASSACHUSETTS

27 March 2013

102CES/CEV
971 South Outer Road
Otis ANG Base MA 02542-1330

Mr. Chuck Green
Tribal Historic Preservation Officer
766 Falmouth Road
Unit A7
PO Box 1048
Mashpee, MA 02649

SUBJECT: Project Notification for a Landfill Solar Array at the Massachusetts Military Reservation (MMR), MA

Dear Mr. Green:

The 102 Intelligence Wing (102nd IW) located at Otis Air National Guard (ANG) Base at the Massachusetts Military Reservation (MMR) on Cape Cod, MA is proposing to construct and operate up to a six megawatt (6 MW) solar array within your Tribe's ancestral homelands. The solar array project is proposed for the closed and capped base landfill and will be awarded to a solar developer under a power purchase agreement. The power produced by the solar array will be used by the Otis ANG Base to offset the power consumption, and associated air emissions, of the 102 IW mission. A description of the project scope and location is attached.

A feasibility study (FS), funded by the Environmental Protection Agency, was conducted by the National Renewable Energy Lab (NREL) for this project and is available at <http://www.nrel.gov/docs/fy11osti/49417.pdf>. The solar array project is proposed for the former base landfill which is located on Connery Avenue in the town of Bourne, MA on MMR. The portion of the landfill under consideration for the solar array consists of approximately 60 acres which was capped in 1995. The landfill is a regulated site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and is managed by the Air Force Civil Engineer Center (AFCEC). The area proposed for the solar array has been previously disturbed through the use as a landfill, which was subsequently capped. As part of post closure requirements, a vegetative surface is maintained on the cap to prevent erosion and encourage evapotranspiration. The cap is mowed once a year to prevent tree and/or shrub growth. Trees and/or shrubs are not desired on the landfill as their root systems could impact the integrity of the cap.

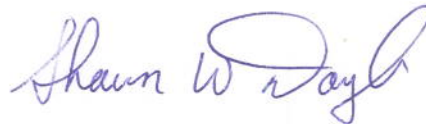
As discussed in the NREL FS, the array installation will include surface-mounted, ballasted solar panels to prevent impacts to the integrity of the landfill cap, similar to other solar arrays installed on landfill caps. The Massachusetts Department of Environmental Protection (MassDEP) encourages the post-closure use of landfills for renewable energy projects as long as the use will not compromise the environmental protection afforded by the landfill cap and closure. MassDEP has

developed guidance including a fact sheet entitled; "Developing Renewable Energy Facilities on Closed Landfills" which is available at <http://www.mass.gov/dep/energy/landfill.htm>.

Please let us know by 10 April 2013 if you have any interests or concerns regarding this project as related to cultural resources of your Tribe. Your response will aid the 102nd IW at Otis ANG Base in complying with Section 106 of the National Historic Preservation Act of 1966, as amended.

Thank you for your assistance. If you have any questions regarding the proposed project or the enclosed materials, please contact me at 508-968-4960; email shawn.doyle@ang.af.mil.

Sincerely,



SHAWN W. DOYLE, Capt, MA ANG
Chief, Environmental Management

Attachment:
Otis ANGB Solar Array Project Brief



Mashpee Wampanoag Tribe

483 Great Neck Rd. South

Mashpee, MA 02649

Tribal Historic Preservation Department

Shawn W. Doyle, Capt, MA ANG
Chief, Environmental Management
102CES/CEV
971 South Outer Road
Otis ANG Base MA 02542-1330

April 25, 2013

RE: Project Notification for a Landfill Solar Array at the Massachusetts Military Reservation (MMR), MA

Dear Capt. Doyle,

I'm writing in response to your letter dated March 27, 2013 requesting Section 106 Review and comments related to the Solar Array project proposed for the MMR. Thank you for providing the map and full description of the project. Based on that information it is agreed that we have no cultural or historic interest in the site, because it is situated upon previously disturbed soils. Using the former landfill cap is an excellent recycle land-use plan in itself.

The Air National Guard is developing an ecological good neighbor reputation with the Tribe. Good luck with the solar array, we hope it yields all the power needed to offset the Otis ANG Base.

In Thanksgiving,

Ramona Peters
Mashpee Wampanoag Tribal Historic Preservation Officer



DEPARTMENT OF THE AIR FORCE
102D INTELLIGENCE WING (ACC)
MASSACHUSETTS AIR NATIONAL GUARD
OTIS AIR NATIONAL GUARD BASE MASSACHUSETTS

27 March 2013

102CES/CE
971 South Outer Road
Otis ANG Base MA 02542-1330

Ms. Bettina Washington
Tribal Historic Preservation Officer
Wampanoag Tribe of Gay Head - Aquinnah
20 Black Brook Road
Aquinnah MA 02535

SUBJECT: Project Notification for a Landfill Solar Array at the Massachusetts Military Reservation (MMR), MA

Dear Ms. Washington:

The 102 Intelligence Wing (102nd IW) located at Otis Air National Guard (ANG) Base at the Massachusetts Military Reservation (MMR) on Cape Cod, MA is proposing to construct and operate up to a six megawatt (6 MW) solar array within your Tribe's ancestral homelands. The solar array project is proposed for the closed and capped base landfill and will be awarded to a solar developer under a power purchase agreement. The power produced by the solar array will be used by the Otis ANG Base to offset the power consumption, and associated air emissions, of the 102 IW mission. A description of the project scope and location is attached.

A feasibility study (FS), funded by the Environmental Protection Agency, was conducted by the National Renewable Energy Lab (NREL) for this project and is available at <http://www.nrel.gov/docs/fy11osti/49417.pdf>. The solar array project is proposed for the former base landfill which is located on Connery Avenue in the town of Bourne, MA on MMR. The portion of the landfill under consideration for the solar array consists of approximately 60 acres which was capped in 1995. The landfill is a regulated site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and is managed by the Air Force Civil Engineer Center (AFCEC). The area proposed for the solar array has been previously disturbed through the use as a landfill, which was subsequently capped. As part of post closure requirements, a vegetative surface is maintained on the cap to prevent erosion and encourage evapotranspiration. The cap is mowed once a year to prevent tree and/or shrub growth. Trees and/or shrubs are not desired on the landfill as their root systems could impact the integrity of the cap.

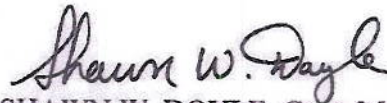
As discussed in the NREL FS, the array installation will include ballasted solar panels to prevent impacts to the integrity of the landfill cap, similar to other solar arrays installed on landfill caps. The Massachusetts Department of Environmental Protection (MassDEP)

encourages the post-closure use of landfills for renewable energy projects as long as the use will not compromise the environmental protection afforded by the landfill cap and closure. MassDEP has developed guidance including a fact sheet entitled; "Developing Renewable Energy Facilities on Closed Landfills" which is available at <http://www.mass.gov/dep/energy/landfill.htm>.

Please let us know by 10 April 2013 if you have any interests or concerns regarding this project as related to cultural resources of your Tribe. Your response will aid the 102nd IW at Otis ANG Base in complying with Section 106 of the National Historic Preservation Act of 1966, as amended.

Thank you for your assistance. If you have any questions regarding the proposed project or the enclosed materials please contact me at 508-968-4960; email shawn.doyle@ang.af.mil.

Sincerely,



SHAWN W. DOYLE, Capt, MA ANG
Chief, Environmental Management

Attachment:
Otis ANGB Solar Array Project Brief

Otis ANGB Solar Array Installation Project

Background and Description

The 102nd Intelligence Wing is pursuing a project to install a 4-6 Megawatt solar array on a former landfill site. The entire infrastructure of the array will be owned and operated by a third party supplier who will sell the energy produced to the 102nd IW through a Power Purchase Agreement (PPA).

The landfill site has been determined to be an excellent location for a solar project by the National Renewable Energy Laboratory. Due to its being a capped, managed landfill, the land has little value for other purposes. Because maintaining the integrity of the cap is crucial, the solar array will be surface mounted with no ground penetrations of any kind.

The life of the contract will be 20 years, after which the contract and condition of the hardware will be re-evaluated to either terminate the agreement or extend it. Upon termination, all solar panels, mounting hardware and supporting infrastructure will be removed and the land restored to current condition.

Justification

A preliminary economic analysis of the PPA shows a potential renewable energy gain of 123 MWh and an energy bill savings of up to \$6.8 Million over the 20 year life of the project. Even given a worst case scenario of no growth in conventional utility prices, a 2% increase in solar power cost per year, and an increase in interest rates to 8%, the PPA could still return up to \$4.9 Million.

Timeline

The Request for Proposal is due to be issued in April 2013, awarded by June. Construction will start in September and the system will be online and producing power by January 2014.

Landfill Area

Description

The landfill area is a 66 acre plot of land in a secure part of the Massachusetts Military Reservation that was used as a general landfill from the 1940s to the 1970s. Since 1995, it has been capped off and managed by the Air Force Civil Engineering Center (AFCEC), which continues to maintain responsibility for its management. The capped area is grassland consisting mostly of gentle slopes and large, relatively flat areas.

Solar Array Installation Areas

The solar array will be built on the grassy areas shown in Figure 2. The forested area is not related to the project. For reference purposes, the plot has been divided into areas referred to as Sites 1, 2 and 3.

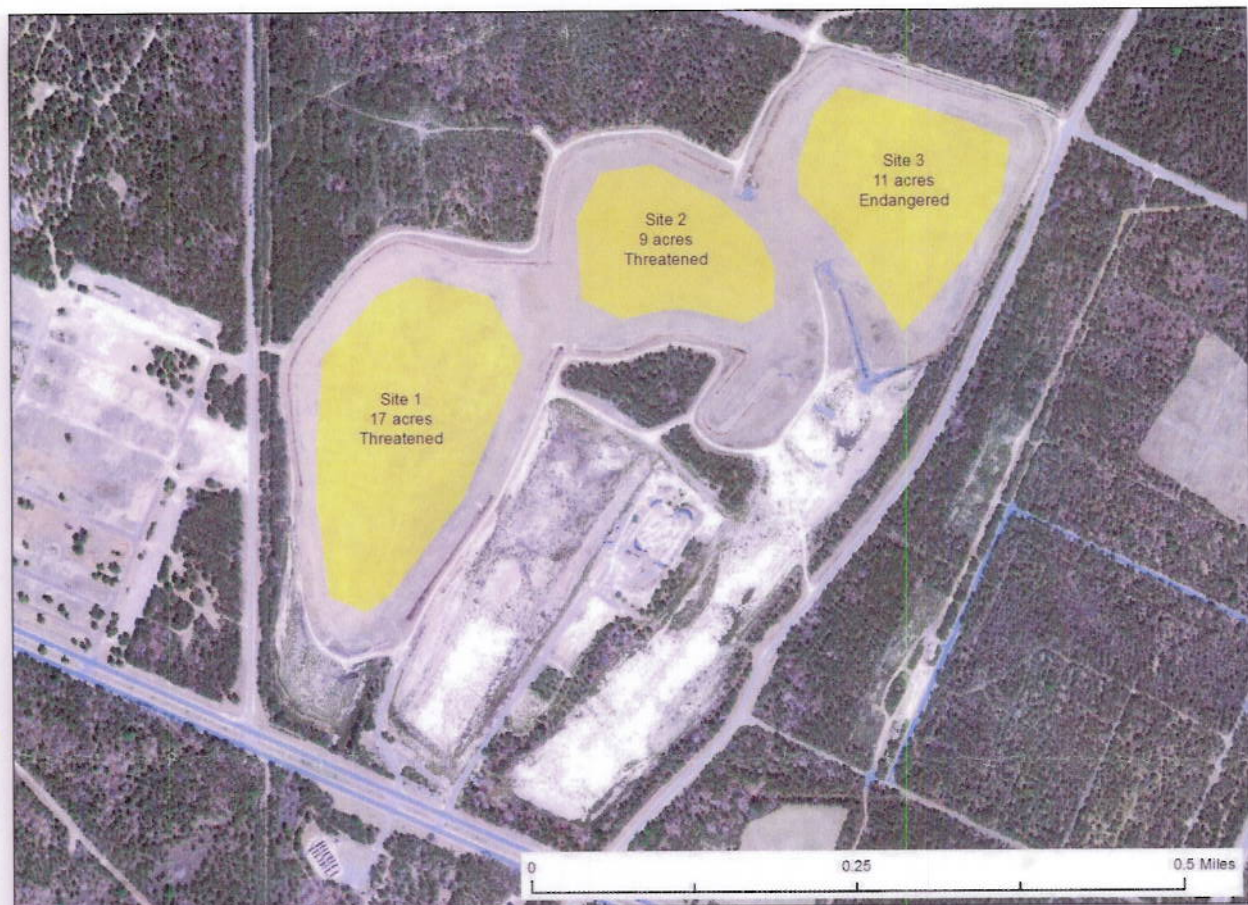


Figure 1: Sites of Proposed Solar Array Installation



DEPARTMENT OF THE AIR FORCE
102D INTELLIGENCE WING (ACC)
MASSACHUSETTS AIR NATIONAL GUARD
OTIS AIR NATIONAL GUARD BASE MASSACHUSETTS

21 May 2013

MEMORANDUM FOR RECORD

SUBJECT: Response to EA by Wampanoag Tribe of Aquinnah

1. Several attempts have been made since 13 March, both by letter and by telephone, to notify the official office of the Tribe of Wampanoag – Aquinnah of the proposed solar array installation on the capped landfill. None of these attempts have been successful.
2. The Tribe of Wampanoag – Mashpee has responded, stating that, because the site has been so heavily disturbed, they have no historical or cultural interest in the site. Because of the prior disturbance, it is reasonable to assume the Aquinnah tribe will have a similar response.
3. The 102nd CES will continue to attempt to make direct contact with the Tribe of Wampanoag - Aquinnah. If these continuing efforts fail, the 30 day public notice period will be taken to be sufficient notification.


SHAWN W. DOYLE, Captain, MA ANG
Chief, Environmental Management



DEPARTMENT OF THE AIR FORCE
102D INTELLIGENCE WING (ACC)
MASSACHUSETTS AIR NATIONAL GUARD
OTIS AIR NATIONAL GUARD BASE MASSACHUSETTS

17 Apr 2013

MEMORANDUM FOR RECORD

FROM Rose Forbes, AFCEC IRP
322 East Inner Road
Otis ANG Base MA 02542

Subject: Discussion with Bourne Conservation Commission on the Landfill Solar Array at the Massachusetts Military Reservation (MMR), MA

1. On 9 Apr 2013, Rose Forbes contacted Brendan Mullaney via email (attached) to discuss the proposed solar array project on the MMR base landfill in the Town of Bourne. The purpose of the discussion was to inform the Bourne Conservation Commission of the proposed project and determine if the Commission had any concerns or required additional information.
2. Brendan Mullaney responded on 9 Apr 2013 stating "The Conservation Commission would only have jurisdiction over the project if it was being proposed in the vicinity of any Wetland Resource Areas or within a FEMA designated Flood Zone. I am assuming that the proposed project is not in one of these two designated areas. Therefore, if the project is not within a FEMA designated Flood Zone or within a Wetland Resource Area or the 100 foot buffer zone to a Wetland Resource Area, than this department has no further concerns with the project."
3. The proposed solar array on the MMR base landfill is not within a FEMA designated Flood Zone or within a Wetland Resource Area or the 100 foot buffer zone to a Wetland Resource Area.
4. Questions on this Memo for Record should be directed to either Capt Shawn Doyle at 508-968-4960 or Rose Forbes at 508-968-4670 x 5613.

Attachment

Email to Brendan Mullaney, Bourne Conservation Commission

FORBES, ROSE H GS-13 USAF HAF AFCEC/CZO

From: FORBES, ROSE H GS-13 USAF HAF AFCEC/CZO
Sent: Tuesday, April 09, 2013 4:08 PM
To: 'BMullaney@townofbourne.com'
Cc: 'Doyle, Shawn W Capt USAF ANG 102 CES/CEO'
Subject: solar project at MMR
Attachments: Bourne_12_31272.pdf
Signed By: rose.forbes@us.af.mil

Hi Brendan - We are looking to develop a multi-MW solar array project at MMR. The project proponent is the 102nd Intelligence Wing (102nd IW) at Otis ANG Base and the proposed location is the closed base landfill located on Connery Avenue in Bourne. The land was used as a landfill starting around WWII and was closed and capped in 1995. The 102nd has completed a consult with the MA NHESP office (attached) and has agreed on a mitigation plan with their office.

Capt Doyle is the project manager for the solar array development and is currently working on an Environmental Assessment (EA). As part of the EA, we are conducting consults with the applicable offices. Since the project is located in the Bourne area of the base, we want to check with you to see if you have any concerns with a solar development on a landfill cap. If you would like to review the project in more detail than this email, we will prepare a package for you to review. If you have no concerns, please let us know and we will document this email communication it in a Memo for Record.

Please advise if you would like to receive additional information about this project.

Thank you in advance for your assistance.

Rose

Rose Forbes, P.E., GS-13
322 East Inner Road
Otis ANG Base MA 02542
Office: 508-968-4670 x 5613
Fax: 508-968-4476
Cell: 210-324-9495



Commonwealth of Massachusetts

Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

March 1, 2013

102nd Intelligence Wing
Otis Air National Guard Base
Mass Air National Guard
158 Reilly Street, Box 22
Bourne, MA 02352

RE: Project Location: Capped landfill on Otis Air National Guard Base
Project Description: Proposed lease and installation of solar array
NHESP File No.: 12-31272

Dear Applicant:

Thank you for submitting the MESA Review Checklist and required materials to the Natural Heritage and Endangered Species Program (NHESP) of the MA Division of Fisheries & Wildlife for review pursuant to the Massachusetts Endangered Species Act (MESA) (MGL c.131A) and its implementing regulations (321 CMR 10.00). The proposed project consists of the installation of a 4-6 Megawatt photovoltaic solar array on 37 acres of the capped landfill at Otis Air National Guard Base.

Based on a review of the information that was provided and the information that is currently contained in our database, the NHESP has determined that this project occurs within the mapped habitat of the Grasshopper Sparrow (*Ammodramus savannarum*; "Threatened"), Vesper Sparrow (*Pooecetes gramineus* "Threatened"), and Upland Sandpiper (*Bartramia longicauda*; "Endangered"). These species are listed pursuant to the MESA.

The NHESP has determined that this project, as currently proposed, will result in a "take" of the Grasshopper Sparrow, Vesper Sparrow, and Upland Sandpiper (321 CMR 10.02). The proposed project will result in the disruption of feeding, breeding, and migratory behaviors of this species, as well as a loss of grassland habitat. A project resulting in a "take" of state-listed species may only be permitted if it meets the standards for issuance of a Conservation & Management Permit (CMP)(321 CMR 10.23). In order for a project to be considered for a CMP, the project proponent must (1) avoid and minimize impacts to state-listed species to the greatest extent practical, (2) demonstrate that an insignificant portion of the local population will be impacted or that no viable alternative exists, and (3) develop and implement a conservation plan that provides a long-term net benefit to the conservation of the local population of the impacted species.

The NHESP anticipates issuing a MESA CMP for this project. This Determination is a final decision of the Division of Fisheries and Wildlife pursuant to 321 CMR 10.18. Any person aggrieved by this decision shall have the right to an adjudicatory hearing at the Division pursuant to M.G.L. c. 30A, s.11 in accordance with the procedures for informal hearings set forth in 801 CMR 1.02 and 1.03. Any notice of claim for an adjudicatory hearing shall be made in writing, accompanied by a filing fee in the amount of \$500.00 and the information specified in 321 CMR 10.25(3). The notice of claim shall be sent to the

www.masswildlife.org

Division of Fisheries and Wildlife

Field Headquarters, 1 Rabbit Hill Road, Westborough, MA 01581 (508) 389-6300 Fax (508) 389-7891

An Agency of the Department of Fish and Game

Division's Director, Wayne MacCallum, by certified mail, hand delivered or postmarked within 21 days of the date of the Division's Determination.

No soil or vegetation disturbance, work, clearing, grading or other activities related to the subject filing shall be conducted anywhere on this project site until the MESA permitting process is completed. If you have any questions regarding this review please contact Eve Schlüter, Ph.D., Senior Endangered Species Review Biologist, at (508) 389-6346 or eve.schluter@state.ma.us.

Sincerely,

A handwritten signature in black ink that reads "Thomas W. French". The signature is written in a cursive style with a large, stylized 'T' and 'F'.

Thomas W. French, Ph.D.
Assistant Director

cc: Captain Shawn Doyle, 102nd Civil Engineering Squadron



DEPARTMENT OF THE AIR FORCE
102D INTELLIGENCE WING (ACC)
MASSACHUSETTS AIR NATIONAL GUARD
OTIS AIR NATIONAL GUARD BASE MASSACHUSETTS

17 Apr 2013

MEMORANDUM FOR RECORD

FROM Rose Forbes, AFCEC IRP
322 East Inner Road
Otis ANG Base MA 02542

Subject: Discussion with Bourne Historic Commission on the Landfill Solar Array at the
Massachusetts Military Reservation (MMR), MA

1. On 9 Apr 2013, Rose Forbes called Mr. Donald Ellis, the Chairmen of the Bourne Historic Commission to discuss the proposed solar array project on the MMR base landfill in the Town of Bourne. The purpose of the discussion was to inform the Bourne Historic Commission of the proposed project and determine if the Commission had any concerns or required additional information.
2. Mr. Ellis stated his opinion is that the landfill cap is the perfect place for a solar array. He did not have any concerns with the project as proposed. He stated the nearest historically significant area is the Indian Trails, north of the landfill, near the former BOMARC missile site. Mr. Ellis requested information on the project so he can brief it to the Bourne Historic Commission members at their next meeting. Information will be sent to Mr. Ellis at the Sagamore, MA office.
3. Questions on this Memo for Record should be directed to either Capt Shawn Doyle at 508-968-4960 or Rose Forbes at 508-968-4670 x 5613.